Final report

OWMC
Ontario
Waste Management
Corporation

A provincial crown corporation

Gartner
Lee
Associates
Limited

SITE SELECTION PROCESS

PHASE 4A: SELECTION OF A PREFERRED SITE(S)

BIOLOGY

A REPORT PREPARED FOR

ONTARIO WASTE MANAGEMENT CORPORATION

BY

GARTNER LEE ASSOCIATES LIMITED

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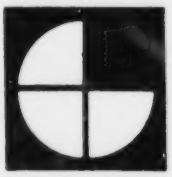

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October 16, 1985.

Dr. B.D. Mitchell,
Director of Corporate Planning
and Development,
Ontario Waste Management Corporation,
2 Bloor Street West,
11th Floor,
Toronto, Ontario,
M4W 3E2.

Attention: Mr. J.G. Micak,
Manager,
Environmental Planning.

Dear Dr. Mitchell:

Re: Final Report, Site Selection Process Phase 4A:
Selection of a Preferred Site(s) - Biology

We are pleased to submit our final report for the above noted project.

The main body of the report is found in this document and contains our work scope, approach, Phase 4A factors and the results of the comparative evaluation of the eight candidate sites. Accompanying this report are eight separate technical appendices, discussing the biological setting of each of the eight sites. These technical appendices contain the data base used in this comparative evaluation.

Once again we thank you for allowing us to be of service on this most interesting project.

Yours very truly,

GARTNER LEE ASSOCIATES LIMITED

Grant Anderson

E.G. Anderson, P.Eng.,
Project Director.

KWD:jcm

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BIOLOGICAL RESOURCES STUDY TEAM

The study was carried out under the direction of Grant Anderson, Project Director, Gartner Lee Associates Limited (GLAL). The study team consisted of:

Dave Osmond, B.Sc.Agr.	- Associate and Senior Biologist of GLAL - Report Review
Kenneth Dance, M.Sc.	- Associate and Senior Biologist of GLAL - Report Writing and Project Management
Thomas Hilditch, B.Sc.Agr.	- Biologist of GLAL - Data Collection
Donald Fraser, M.Sc.	- Biologist of GLAL - Site Report Preparation
Wayne Weller, M.Sc.	- Biologist of GLAL - Data Collection

EXECUTIVE SUMMARY

PURPOSE OF THE REPORT

- To identify those biology factors which, in conjunction with other environmental, planning and engineering factors were used in the detailed comparative evaluation of candidate sites, keeping in mind OWMC's site selection goals and objectives.

- To explain the rationale and approach used in the identification of biological factors for the various study areas assessed in the detailed comparative evaluation of candidate sites.

- To provide a ranking of siting options based on biology factors and study areas assessed during Phase 4A.

SCOPE AND METHOD

- Biology factors were among numerous considerations used to address goals and objectives of the site selection process.

- Selection of biology factors was related to OWMC goals and objectives for the site selection process.

- Biology factors dealt only with environmental impact considerations.

- The study relied heavily upon published information sources, augmented by field work within acquisition boundaries of the sites.

- The study also considered public input which included commentary on factors and indicators used in Phase 4A, and opinions on the rank to place on biology factors relative to other impact factors.

- Biology factors were identified and applied in detailed comparative evaluation for the following study areas:

    - site
    - site vicinity
    - access roads to sites

- Biological assessment contributed to the following elements of the Phase 4A study program:

    - boundary refinement
    - road access
    - rail options
    - location of physical/chemical treatment plant
    - comparative evaluation of siting options

A brief discussion of each of these elements of the Phase 4A program follows.

BOUNDARY REFINEMENT

- This activity was designed to reduce the size of those sites which were larger than required to provide 20 years of landfill life. Boundary refinement provides for comparison of more equal sized sites. This activity also potentially reduces impacts associated with acquisition of more land e.g. parcel severances.

- Boundary refinement was conducted on sites PI-1N, LF-3C and LF-1E.

- Existing data from Phases 3B and 4A were used. Site field work results were available for this assessment.

- The area eliminated from the site during boundary refinement was added to the site vicinity study area.

- Biological constraints and issues were identified and recommendations on boundary refinement were provided to the site selection team.

- The result was boundary refinement which reduced site size, at the same time attempting to minimize impacts.

ROAD ACCESS

- Existing data were used in predicting potential impacts from the use of access roads on biological resources.

- In the event of a liquid waste spill during transport, streams that are crossed by the access roads could be contaminated, thereby potentially impacting fish and other aquatic life.

- The Phase 4A access route assessment involved two steps:

  (1) Phase 3B access route data were used,
  (2) downstream length of regionally and locally significant fishery reaches were calculated.

- Biological ranking of access route options to candidate sites was provided to the site selection team.

- The access route preferred by the site selection team was combined with the appropriate site and site vicinity study areas, to yield the facility siting options assessed during detailed comparative evaluation.

RAIL OPTIONS

- Existing data from Phase 3B and 4A studies were used and no additional field work was required.

- Two steps were involved:

  (1) constraint mapping within broad corridors,
  (2) comparative evaluation of specific rail alignments.

- Biological constraint mapping and descriptions were provided for Step 1 and biological ranking of rail alignment options was provided to the site selection team in Step 2.

- Rail was viewed only as an opportunity. It was not considered as part of the facility options assessed in the detailed comparative evaluation.

LOCATION OF PHYSICAL/CHEMICAL TREATMENT PLANT

- This element in the Phase 4A program assessed the relative impacts of placing the physical/chemical (P/C) treatment plant with the landfill or with the incinerator, in partially integrated siting options.

- Two biological considerations relating to this issue were assessed:

  (1) flexibility for avoiding constraints on landfill sites if the P/C plant were placed with the incinerator; the potential flexibility is negated if the extra space is used to extend landfill life,

  (2) placement of P/C plant affects potential for access road impact; untreated waste is transported to both sites when the P/C plant is placed with the landfill and to one site when the P/C plant and incinerator are together.

- Advice on the biological implications of P/C plant placement was supplied to the site selection team.

COMPARATIVE EVALUATION OF SITING OPTIONS

- The three major elements of the biology assessment involved study of the site, site vicinity study areas and an overall assessment resulting from combination of the two study areas and the preferred access route.

SITE

- This is the area within the boundaries following boundary refinement.

- It was assumed that all biological features on the site would be lost during facility development.

- Data sources include the following:

  - field observations
  - walk-and-talk replies
  - information from citizens and special interest groups
  - agency and ministry personnel
  - existing reports

- A ranking of siting options resulted from comparison of relative impact levels expected for site factors.

SITE VICINITY

- This is the area beyond the site boundary, extending out approximately 2 km.

- Most impacts in this zone are unknown at this time and expected to be less direct than those on site, and of small magnitude.

- It was assumed that all biological features in this study area could be affected.

- Data sources were the same as for the site, except that no field work was done in the site vicinity.

- The ranking of site vicinities was based on potential impacts in the site vicinities.

SITING OPTIONS

- This is the combination of site and site vicinity study areas and their respective access route.

- Input to the detailed comparative evaluation included relative impact level (factor suitability levels) for factors in each study area, and the importance (rank) assigned to each factor.

- A review of the factor/study area assessment resulted in ranking of the six options in order from most to least preferred according to biology factors.

- Biology factor suitability levels and factor ranking were provided to the site selection team for use in comparison of siting options.

PREMISES AND POSTULATES

PREMISES

- Biology factors were developed in response to the OWMC goal: to minimize environmental impacts.

- Phase 4A objectives were developed to fulfill OWMC goals. Objectives of the Phase 4A biology study were:

  (1) to document pertinent characteristics of existing biological resources in study areas;

  (2) to develop and apply an analytical process which could identify potentially significant biological impacts which might be created by the undertaking; and

  (3) to document the results of (1) and (2), and to demonstrate any relative differences in potential for impact associated with various siting options.

POSTULATES

- Facility characteristics as outlined in Status Report, Facility Design (Monenco Limited, 1985a) and Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Engineering (Monenco Limited, 1985b) provide the current description of the undertaking.

- It was assumed that all biological features on the site would be lost and that all biological features in the site vicinity study areas could be affected, and that the relative magnitude of impact associated with study areas can be directly related to the quantity of features present. The significance of features was considered via factor ranking.

- It was only necessary to conduct site field work in order to undertake the comparative evaluation of siting options.

- The detailed comparative evaluation is based on the postulate that a relative comparison of potential impacts associated with siting options provides a reflection of biological constraint associated with specific options.

- Given what is known presently, mitigation is not required to make any candidate siting options acceptable biologically; hence, mitigation is viewed as a means of enhancing site suitability.

STATUS OF DATA

- Contact with the public, agencies and interest groups was extensive during this stage of the process; all significant sources of information were assessed during Phase 4A.

- Meetings with citizens' groups, special interest groups and data review activities with agencies were established to ensure the completeness and accuracy of the data base.

- Species lists, current knowledge of rare species occurrence and distribution patterns on sites provides an adequate basis for completing the comparative evaluation of siting options.

- Interpretations of stream fish community significance completed for use in the access road assessment, were reviewed by the Ministry of Natural Resources.

- Data available during Phase 4A facilitated an effective comparison of siting options.

MAIN FINDINGS

- All siting options passed the biology basic acceptability screen.

- Six siting options were assessed during the detailed comparative evaluation.[1]

- There are no confirmed occurrences of species listed in the Endangered Species Act (1971), on OWMC candidate sites.

- Rare species were recorded on several candidate sites. All of these rare species are known to occur in several other locations in southern Ontario.

- Vegetation patterns on all candidate sites have been influenced by land use activities. Those forested areas which do exist are generally small and the woodlots have been subjected to harvesting for firewood and logs.

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1. Candidate site LF-2N did not pass the hydrogeology basic acceptability screen, see Site Selection Phase 4A: Selection of a Preferred Site(s) - Interim Site Selection Report Candidate Site LF-2N (M.M. Dillon Limited, 1985c).

- OWMC candidate sites and site vicinities do not contain portions of significant woodlots deemed to be representative examples of deciduous forest complex, as identified by the Carolinian Canada Program.

- Comparative evaluation of siting options based on biology factors resulted in three groups of options being identified. Differences among options in the two most preferred option groups were considered to be small.

- The biology facility siting option ranking from most preferred to least preferred is as follows:

  Group A - LF-4N/PI-1N
  LF-9C
  LF-4N/PI-13N

  Group B - LF-3C
  LF-1E

  Group C - LF-1E/PI-27E

- Sensitivity analysis of the implications of different site boundaries at LF-3C and LF-1E revealed that major changes in siting option ranking would not be involved. Similarly, provision of rail access is not expected to create significant changes in siting option ranking. It is assumed that partial solidification would not affect siting option ranking.

- Mitigation is not required to ensure basic acceptability of the OWMC preferred site LF-9C.

CONCLUSIONS AND RECOMMENDATIONS

- Phase 4A has provided a more detailed comparison of biological conditions on the candidate sites than was possible in Phase 3B.

- All sites passed the basic acceptability screen for biology.

- Siting options were placed in three groups when ranked.

- The LF-1E/PI-27E option was clearly the least preferred of the six siting options subjected to the detailed comparative evaluation.

- The LF-9C option, which was selected as the preferred option by OWMC was placed with the two northern siting options in the group of most preferred sites, from a biological perspective.

- It was concluded through sensitivity analysis, that certain boundary refinements, provision of rail access and partial solidification would not create major differences in siting option ranking.

The following indicates recommendations for Phase 4B:

- It is recommended that detailed year-round investigation of biological conditions on the preferred site and other appropriate study areas be completed.

- Appropriate mitigative measures should be implemented to minimize impacts on biological resources which might be affected by construction, maintenance and operation of OWMC facilities;

- Phase 4B data collection should be designed to provide a baseline for long-term monitoring of environmental conditions in the study area and data for impact prediction.

1.0 INTRODUCTION

1.1 BACKGROUND

The Ontario Waste Management Corporation (OWMC) has been involved in a five-phase Facility Development Process. Key elements of this process are illustrated in Figure 1. This report deals with biological considerations addressed during Phase 4A of the Facilities Development Process.

During the previous phase of the process (Phase 3B), eight candidate sites were identified. Locations of these sites are shown on Figure 2.

Phase 4A was designed to select a preferred site, or combination of sites for the waste treatment facilities. These facilities include a physical/chemical treatment plant, an incinerator and a landfill.

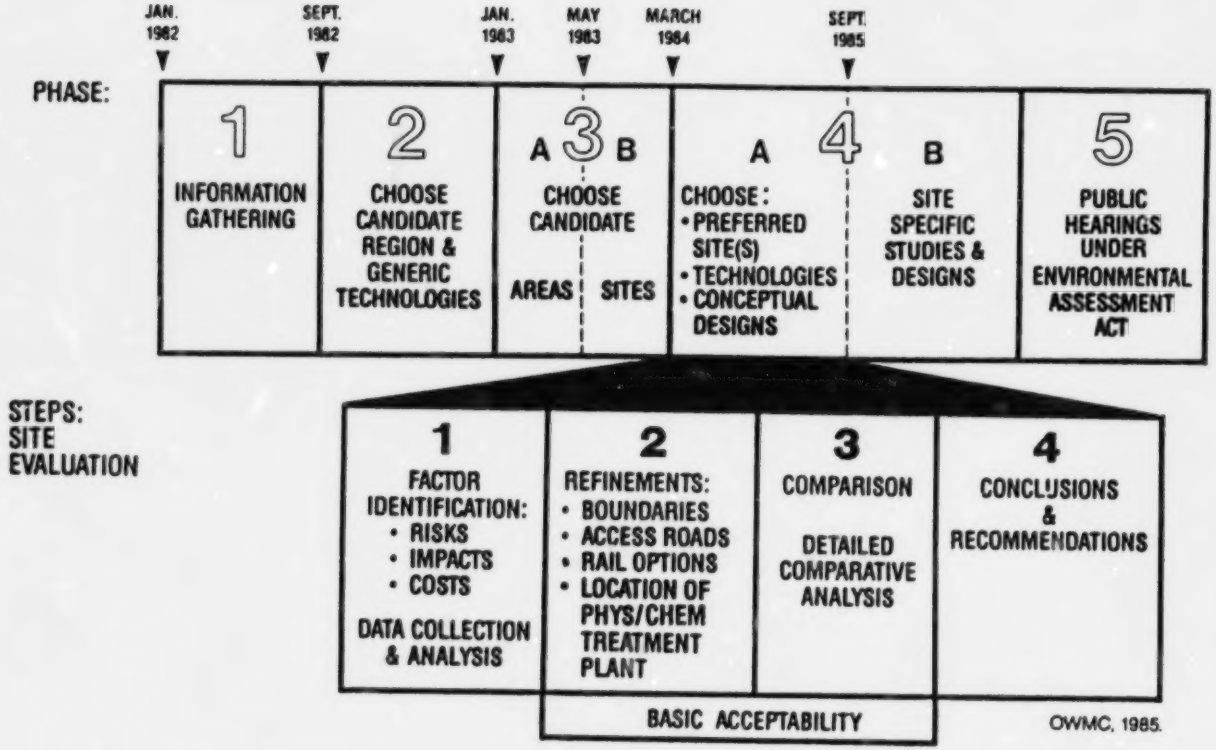
OWMC's three site selection goals are:

(1) to minimize risk to human health;
(2) to minimize environmental impact; and
(3) to minimize financial cost to OWMC and the people of Ontario.

The study of biological considerations in the site selection process contributes to the goal of minimizing environmental impacts.

Figure 3 illustrates major components of the Phase 4A

FIGURE 1 FACILITIES DEVELOPMENT PROCESS



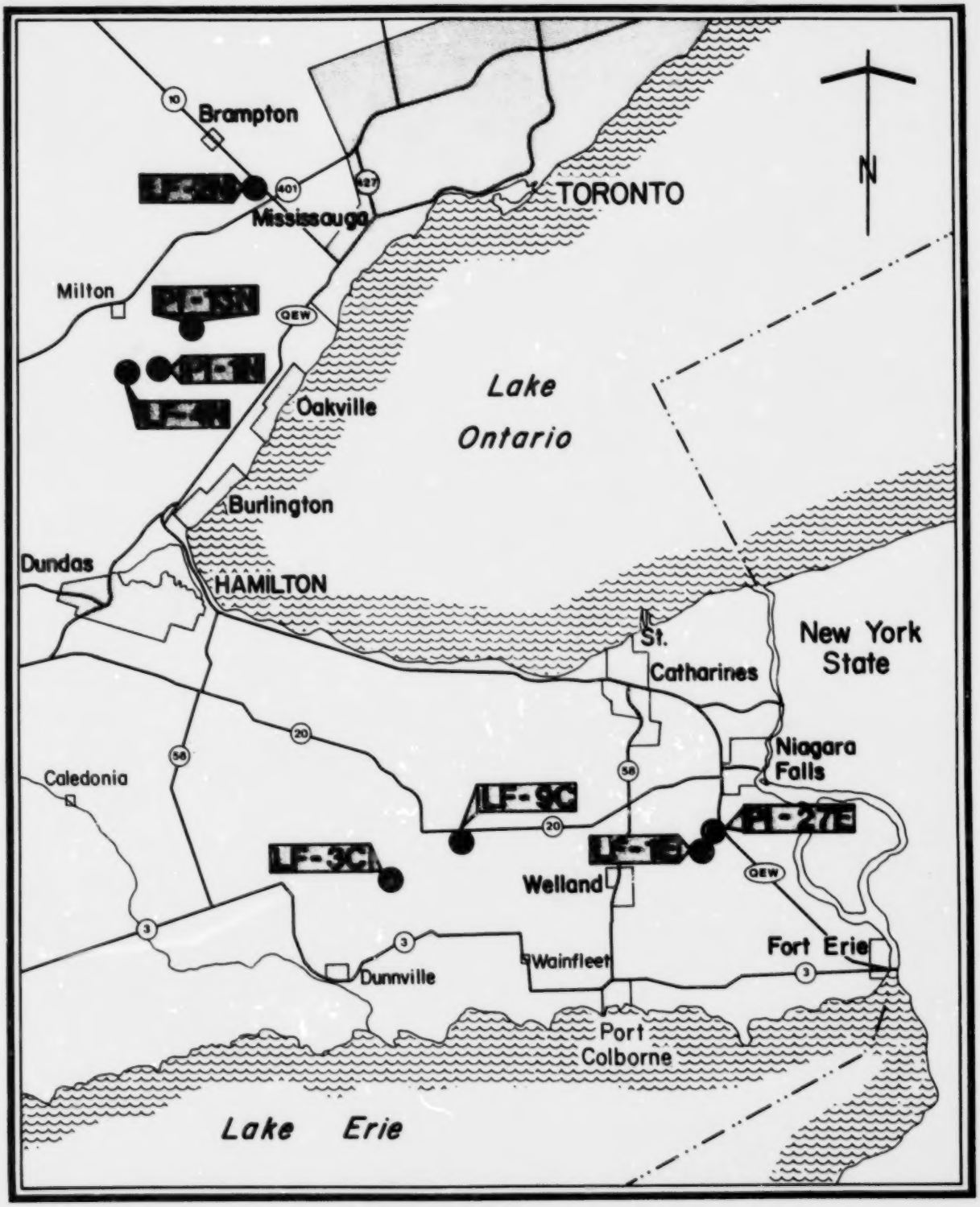
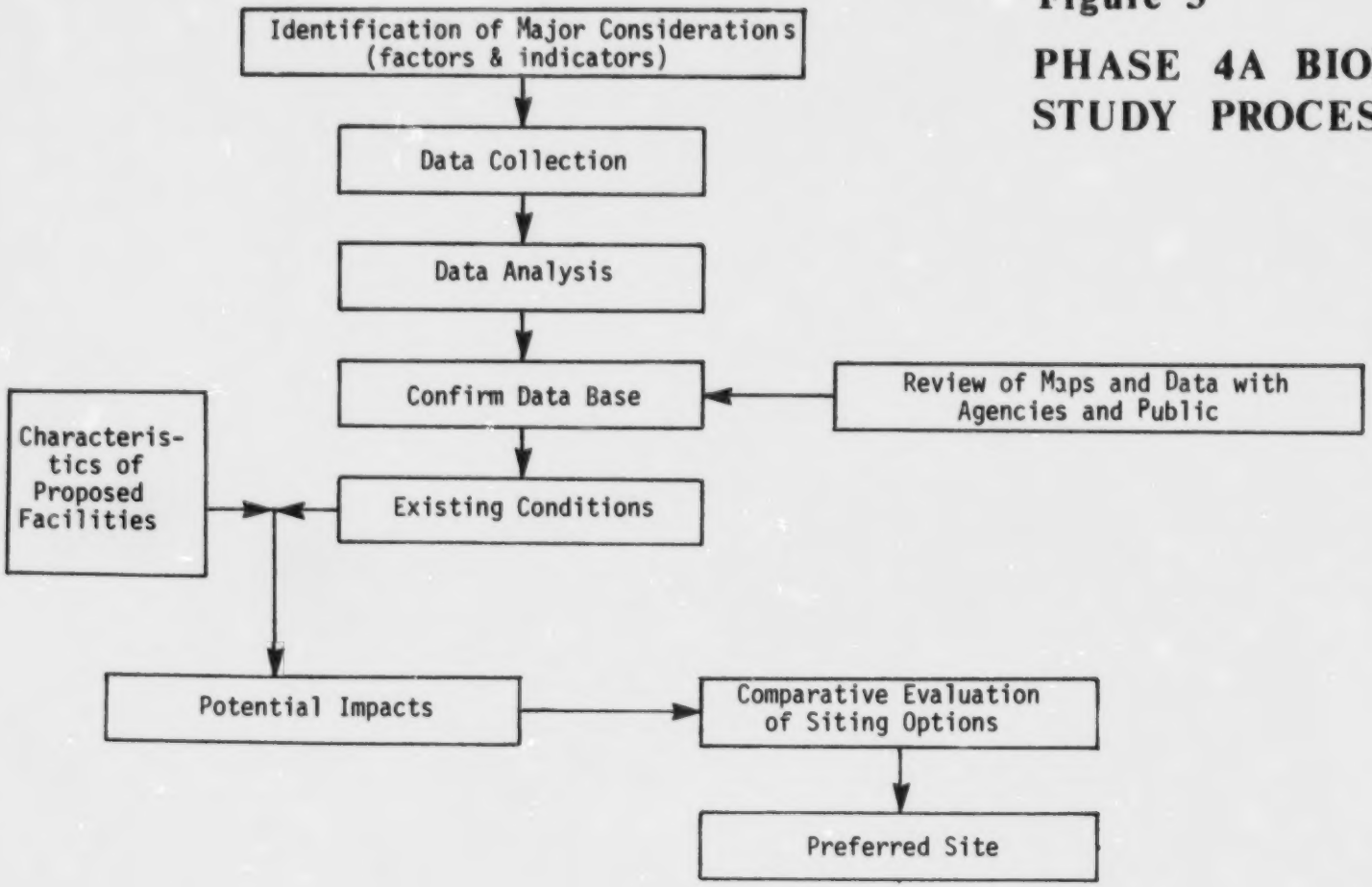


FIGURE 2 LOCATION OF CANDIDATE SITES

Figure 3

PHASE 4A BIOLOGY STUDY PROCESS



biology study process. These components are addressed in more detail in subsequent chapters.

For an understanding of the role of other disciplines in the site selection process, the reader is referred to individual technical reports on hydrogeology, planning, etc. and to "Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Site Selection" (Dillon 1985a). This report describes the overall site selection process.

1.2 PURPOSE AND SCOPE

Phase 4A is the Detailed Comparative Evaluation of candidate sites. The role of biology in this evaluation is summarized in Figure 4. This report identifies the objectives of the biology studies and the factors and indicators which were applied during the comparison process. The biological impacts associated with placing components of the facility at various sites are documented as is the comparison of siting options.

This report presents analysis of data contained in the Phase 4A technical appendix volumes which describe biological conditions on each site. As well, new data are presented in the access road assessment.

It is essential that the purpose and scope of the Detailed Comparative Evaluation is clearly understood. This evaluation is designed to yield a comparison which will identify major differences between options. An assessment of major issues was completed to facilitate this relative comparison.

FIGURE 4: ROLE OF BIOLOGY IN PHASE 4A

STAGES	ROLE OF BIOLOGY
Refinement of Siting options • access roads • rail access • boundary refinement	Identification of preferred rail and access route(s) to each siting option Identification of constraints to facility development on sites PI-1N, LF-3C and LF-1E.
Location of phys./chem. treatment plant PI-13N/LF-4N, PI-1N/LF-4N, PI-27E/LF-1E	Input to review of this issue
Basic Acceptability • assess for all siting options	Review of biological conditions
Partial Solidification/ Rail Access • implications of these potential changes	Review of biological conditions
Comparison of Siting Options • site and site vicinity study areas • complete siting options for options: LF-4N/PI-1N, LF-4N/PI-13N, LF-3C, LF-9C, LF-1E, LF-1E/PI-27E	Ranking of siting options based on biological conditions

1.3 OBJECTIVES OF PHASE 4A BIOLOGY STUDY

As noted previously, the biology study was designed to identify which candidate siting options minimize environmental impacts on biological features. Objectives were identified which focussed the Phase 4A biology study on this goal.

Objectives were:

(1) to document pertinent characteristics of existing biological resources in study areas;

(2) to develop and apply an analytical process which could identify potentially significant biological impacts which might be created by the undertaking; and

(3) to document the results of (1) and (2), and to demonstrate any relative differences in potential for impact associated with various siting options.

The approach developed to attain these objectives is introduced in the remainder of Chapter 1. Details of the methods and results of the study are contained in subsequent chapters.

1.4 GEOGRAPHIC EXTENT OF STUDY AREAS

'Study areas' are referred to frequently throughout the report. A discussion of the "site" and "site vicinity" study areas is provided here since it is a critical element in understanding the study methodology.

SITE

The boundaries were provided by OWMC based on property acquisition limits determined at the end of Phase 3B. Field studies of the "site" were conducted by GLAL.

SITE VICINITY

A radius of approximately 2 km from the center of sites was chosen as the "site vicinity" study area. In this area, less direct, off-site impacts varying in type and degree could be expected.

- During construction noise, fugitive emissions, sedimentation and changes in drainage patterns and soil moisture regimes might occur in the site vicinity.

- Facility operation may create some off-site impacts such as those mentioned above within the 2 km radius.

1.5 FACTORS AND INDICATORS

Factors are positive or negative considerations which assist in comparing siting options. The biology factors refer to impact considerations. Factors are subdivided into indicators. Indicators are ways of more precisely identifying, describing and predicting impacts.

Factors were chosen, for each study area, on the basis of their ability to contribute to achieving the study objectives.

The factors and indicators used to focus data collection and analyse impact are discussed in chapters on specific option or study area comparisons.

Factors and indicators chosen at the beginning of Phase 4A form the organizational framework for data presentation in the separate technical appendices.

Usually, impact prediction efforts concentrate on effects expected to influence "significant" resources or receptors. Beanlands and Duinker (1983) have outlined the range of social perceptions and values which influence the environmental impact assessment process. These include concern for:

(1) human health and safety,
(2) potential loss of commercially or recreationally important resources,
(3) loss of endangered species, and
(4) potential loss of habitat.

Human health and safety have been dealt with by other members of the site selection team, as part of risk considerations.

Phase 4A biology factors and indicators acknowledge the significance of concerns (2) through (4), noted above.

Table 1 lists the factors used during siting option comparison. This table also indicates which study areas the factors relate to.

The time frames over which the factors apply are also identified in Table 1. Factors under the construction heading address potential impacts during the period of facility development. 'Operational' and 'Post Operational' refer to factors addressing potential impacts during facility

TABLE 1

FACTORS USED IN THE COMPARISON OF SITING OPTIONS AND ALTERNATIVES WITHIN OPTIONS

FACTORS	STUDY AREA			Comparison of Alternatives Within Siting Options		Basic Acceptability Of Siting Options	Comparison Of Siting Options	TIME FRAME		
	Access Road	Site	Site Vicinity	Access Road	Boundary Refinement			Construction	Operational	Post Operational
• Rare species		x	x		x	x	x	x	x	x
• Natural vegetation displaced		x				x	x	x		
• Potential for occurrence of additional significant features		x				x	x	x		
• SEUs	x		x			x	x	x	x	x
• Other natural vegetation			x			x	x	x	x	x
• Fish and wildlife features of significance	x		x			x	x	x	x	x
• Non SEU woodlots >20 ha	x					x		x		
• Fish communities	x			x		x	x	x	x	

TABLE 1 (cont'd.)

FACTORS USED IN THE COMPARISON OF SITING OPTIONS AND ALTERNATIVES WITHIN OPTIONS

FACTORS	STUDY AREA			Comparison of Alternatives Within Siting Options		Basic Acceptability Of Siting Options	Comparison Of Siting Options	TIME FRAME		
	Access Road	Site	Site Vicinity	Access Road	Boundary Refinement			Construction	Operational	Post Operational
• Natural vegetation communities		x			x					
• Fish and wildlife communities		x			x					

operation, and over the long term following facility closure, respectively.

1.6 FACILITY CHARACTERISTICS

As noted in Section 1.3, the biology study team undertook to identify characteristics of the facility which might create impacts on biological resources. Facility design characteristics are contained in "Status Report, Facility Design" (Monenco Limited, 1985a) and Site Selection Process, Phase 4A: Selection of a Preferred Site(s) - Engineering" (Monenco Limited, 1985b).

The following is a list of facility characteristics which were thought to influence the potential for natural environment impacts:

- water from portions of the site where there is no potential for contamination will be discharged off-site to a suitable local watercourse;
- uncontaminated surface drainage will pass through retention ponds to restrict downstream flow to pre-development peak flows and reduce sediment loadings;
- water from portions of the site where there is potential for contamination will be collected, tested and treated if necessary;
- each site will have only one storm water outfall;

- the best available proven technology will be used in the design of the incineration plant flue gas treatment system

- the incinerator will be designed and operated to ensure a Destruction and Removal Efficiency of at least 99.99% for each Principal Organic Hazardous Constituent in the waste feed;

- measures to minimize volatile fugitive emissions and dust will be part of the facility design;

- the landfill will be located outside the central operational area, in areas that avoid flood plains;

- the central operating area of the facility will be fenced;

- if necessary, streams flowing onto a site would be diverted away from the central operating area;

- outside lighting would be designed to minimize off-site impact;

- for purposes of the biological impact assessment, we have assumed that the entire study area, following the boundary refinement exercise, will be cleared for construction purposes; since the rail corridor on PI-27E would function as the edge of the site impact zone and since only a physical-chemical treatment plant and incinerator would be placed on this site, we have assumed that biological impacts would be confined to the area south of the railway corridor;

- some elevation in noise levels beyond the site boundaries will be associated with the OWMC facility, see Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Transportation (Dillon, 1985b) and

- truck traffic associated with the OWMC facility will create periodic increases in noise levels and traffic volumes (Dillon, 1985b).

These facility characteristics were considered during identification of factors and study areas. Facility characteristics also provided background to the listing of potential construction impacts addressed in Section 1.7.

1.7 CONSTRUCTION IMPACTS

The present impact prediction approach concentrates on those major changes which can be predicted with most certainty. Construction impacts fall into this category. Construction impacts were considered when refining factors and indicators.

Table 2 contains a list of potential construction impacts which might occur in the site and site vicinity study areas. Table 2 might apply to any site depending upon the resources present and the facilities proposed. More site specific assessments of impact potential are contained in chapters on study area evaluations.

1.8 LIMITATIONS

Limitations associated with Phase 4A relate mainly to the

TABLE 2: CONSTRUCTION IMPACTS AFFECTING RELATIVE SUITABILITY OF SITING OPTIONS

Impact on Site Study Area	Description
(a) Vegetation removal	- vegetation loss, loss of wildlife habitat, caused by earth moving
(b) Drainage works	- impact aquatic habitat
(c) Erosion, siltation	- impact aquatic habitat
(d) Machinery noise	- affect wildlife
(e) Alter soil moisture regimes	- affect vegetation (short term and long term)
(f) Fencing	- barrier to wildlife movement
Impact in Site Vicinity Study Area	**Description**
(a) Loss of on-site habitat	- affect local wildlife habitat availability and patterns
(b) Drainage courses and siltation	- downstream, off-site effects on wildlife
(c) Machinery noise	- potential off-site effects on wildlife
(d) Soil moisture regimes	- along altered drainage channels, and possibly adjacent to site boundaries
(e) Fencing	- cause a barrier to wildlife movement

data base as presented in separate technical appendices. They include the following:

(1) The data base must be evaluated within the framework of differences in availability of published data. This is especially true with respect to the site vicinities. The number of plant species known from site vicinities varies considerably among candidate sites;

(2) Symbols on maps which show the location of rare species, vegetation units and significant fish and wildlife features should be recognized as being approximate due to changes in mapping scale and the range of data sources (e.g. input from "walk-and-talk" data);

(3) Species lists for site and site vicinities probably do not contain every plant and animal in the area; rather, they are intended to summarize what is known to date, and to indicate the characteristics of the communties present; and

Despite the limitations noted above, the biology data available during Phase 4A provided for an adequate comparison of siting options.

1.9 REPORT FORMAT

This report summarizes the study process and describes the methods used in applying biology findings in the detailed comparative evaluation. Existing biological conditions for

the study areas of each site are described in eight separate technical appendices to this report.

Data analysis methods, results and comparison of road, and rail options, boundary refinement and the location of physical/chemical treatment plant are detailed in the present report.

The approach to impact prediction, and comparison of siting options are also dealt with in this volume.

Appendices in this volume contain factor sheets (Appendix A), a glossary (Appendix B) and maps which show refined site boundaries, access road options and rail access options (Appendix C).

Eight separately bound technical appendices describe data collection methods and sources, and existing biological conditions on the sites and in the site vicinity of each of the eight candidate sites.

The technical appendices are composed of biological data in a text and appendix format. Biology data maps are also contained in the technical appendix for that site.

1.10 ROLE OF THE PUBLIC AND AGENCIES

As noted in each technical appendix, the public and agencies provided information on conditions in the study areas. Review of the draft data maps and appendices by members of the

public and agencies assisted in assuring completeness and accuracy of the data base.

Meetings and workshops provided opportunities for feedback on the factors and indicators being used and ranking of impact factors.

Instances in which public or agency input had a major influence on analytical approaches are noted throughout the text of this report.

2.0 REFINEMENT OF SITING OPTIONS

2.1 INTRODUCTION

Chapter 2 presents the methods used and results of four assessments designed to refine siting option components. As a result of Phase 4A engineering design work and site selection team research, it was possible to refine site study boundaries, assess rail and road access options and to determine where the physical/chemical treatment plant should be placed. Each of these refinement activities is reported in separate major sections of Chapter 2.

Siting option refinement preceded the evaluation of complete siting options in which facility option packages (i.e. site, vicinity and preferred access road combinations), are compared.

2.2 BOUNDARY REFINEMENT

2.2.1 INTRODUCTION

Three of the candidate sites, LF-1E, PI-1N and LF-3C, as delineated during Phase 3B, were larger in size than would ultimately be required for facility development. In order to minimize the disruption of existing land ownership and the environment, the sites were evaluated by the site selection team with the intent of reducing them in size. To accommodate this, potential constraints to facility development were identified, and where possible, the boundaries of the sites were redefined to exclude constrained areas (constraint

mapping). The remaining areas were refined based on such considerations as property boundaries.

The role of biology in the delineation of site boundaries is described in the following sections.

2.2.2 BOUNDARY REFINEMENT - METHODS

Facilities proposed for the site and constraints existing on, or in close proximity to the sites assisted in redefining the site boundaries.

The method used to incorporate biology considerations in boundary refinement was essentially constraint mapping using Phase 4A site biology data. As well, significant site vicinity resources influenced the placement of site boundaries.

Biology factors applied during boundary refinement were:

- rare species
- natural vegetation communities
- fish and wildlife communities

The factors identify existing conditions which might pose constraints to facility placement. These factors, described in Appendix A, focus on habitat and significant species.

No separate data maps were prepared for boundary refinement. Data were extracted from maps and text contained in Technical Appendices LF-1E, PI-1N and LF-3C, which are provided separately.

Constraint maps appear in Dillon (1985a).

2.2.3 APPLICATION OF BIOLOGY DATA

PI-1N

There are no biology factor occurrences on site. However, the preference to contain the site in the Sixteen Mile (Oakville) Creek basin instead of the Bronte Creek basin (on the basis of fisheries significance) was brought to the site selection team's attention.

It was noted that the woodlot near the east corner of the site contains several mature White Oak trees, although these are neither a rare species nor a significant vegetation community.

LF-3C

Generally, the biological concern on LF-3C is with potential removal of wooded tracts which provide habitat for wildlife and harbour rare species.

It was indicated that:

- Beaver Creek and an unnamed backwater of the Welland River situated in the southeast corner of the site support pike spawning runs;

- Golden Seal, a regionally endangered and provincially and nationally rare plant, is reported by de Boer (pers. comm. 1985), from the northcentral or northeast corner of the site, along Beaver Creek;

- the woodlot east of Krick Road is the most signif-

icant wooded tract as it contains Pin Oak, Tupelo, and Southern Arrow-wood, which are all regarded as rare species. The Peaire Woodlot contains several large specimens of White Oak; and

- parts of the woodlot in the western and central portion of the site have been recently disturbed by logging.

LF-1E

The major biological factor occurrences on this site relate to the wooded areas and rare plant and animal species reports across the site. A woodlot in the northern part of the site was identified as a part of SEU 19-2 (Horse Track Woodlot) by Brady et al. (1980), as was the woodlot along the western edge of the site, south of Young Road.

Data from Gartner Lee field studies indicate that the woodlots north of Young Road are larger and there is more interspersion among vegetation cover types.

The woodlot in the northeast is the largest on site and displays no recent evidence of logging activity. The largest woods south of Young Road have been cut recently near the center of the two woodlot lobes.

The variety and abundance of rare species are approximately equal on the north and south halves.

The occurrence of the Lyons Creek Valley to the south of Site LF-1E is an important off-site habitat feature which was recognized.

As noted above, both the north and south portions of LF-1E contain biology factor occurrences. Hydrogeologic suitability analysis indicated a preference for the northern parcel. The task was to define a southern boundary for the northern parcel. In order to minimize impacts on the natural environment we recommended that the boundary be placed to retain the woodlots south of Young Road.

Woodlot and rare species habitat was retained south of Young Road and the site was placed on the north parcel, farthest away from Lyons Creek.

SUMMARY

"Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Site Selection" (Dillon, 1985) documents the procedure which led to the boundary refinements for these sites. Revised boundaries for LF-1E, LF-3C and PI-1N as defined by the site selection team using multidisciplinary factors, are presented in Figures C1, C2 and C3, Appendix C.

Phase 4A biology data and maps for the lands within the Phase 3B site boundaries are contained in the individual technical appendices for Sites PI-1N, LF-3C, and LF-1E.

2.3.ACCESS ROAD OPTIONS

2.3.1 INTRODUCTION

The purpose of this section is to describe the procedure used in the detailed comparative evaluation of access road options from a biological perspective. This exercise resulted in the identification of preferred access routes to each siting option.

The biological factors and indicators used in the comparative evaluation of access road options were based on the OWMC goal of minimizing environmental impacts.

There were two steps involved in the Phase 4A assessment of road options. Step 1 involved a preliminary evaluation of access road options and included consideration of several new options identified since the end of Phase 3B. Step 2 involved a comparison of the options remaining after Step 1. The various access road options are shown in Figures C4 to C15 - Appendix C.

During the first step, the Phase 3B factor and data base were used. A more detailed data base was assembled and analysed during the second step.

2.3.2 STEP 1

For the Step 1 access road analysis the Phase 3B approach was used. Access roads were defined as regional and local roads from the 400-series highway to the site. It was assumed that impacts on the aquatic environment might occur in the event of a spill along these portions of the route.

To allow a comparison of alternative access routes, Stream Crossings were identified as a biological factor, since they represent potential points of waste entry into a stream in the event of an accidental spill. The stream crossing factor recognizes the potential for impacts on downstream fish populations and habitat.

Working tables and maps at a scale of 1:50,000 were prepared which indicate regional and local roads, stream

names, numbers of stream crossings, type of watercourse (permanent or intermittent), and any known sensitive water use information for each stream crossing identified.

Information concerning significant fisheries was obtained primarily from Ontario Ministry of Natural Resources file reports, data sheets and maps.

Table 3 contains the results of the access road option analysis carried out during Step 1. Option numbers and descriptions differ from those listed in Table IV of the Phase 3B Biology report (GLAL 1984) since some options had been evaluated and deleted and others were added prior to Phase 4A.

Numbers of stream crossings were reported under four headings: sensitive use known, no sensitive use known (subdivided into number of crossings of permanent and intermittent streams), and total number. Access routes were divided into regional road and local road segments and stream crossing assessments were carried out separately for each.

Constraint ratings were assigned to both regional and local road segments for each access road option. A "no constraint" interpretation was assigned if there were few stream crossings, all of which involved intermittent streams with no known sensitive use. A "minor constraint" was defined as a situation in which there were few stream crossings involving permanent streams with no known sensitive use. In cases where there were many stream crossings of both permanent and intermittent streams with no known sensitive use,

TABLE 3
ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE PERMANENT	NO SENSITIVE USE INTERMITTENT	TOTAL NUMBER		
LF-3C	1. From QEW	1	3	19	23		Major
	Regional: south on Vineland Townline Rd. (Regional Rd. 24); west on Hwy 20; south on Regional Rd. 27	1 crossing 20 Mile Creek, salmonids below escarpment	3 crossings including Parkers, 15 Mile and 16 Mile Creeks				
	Local: west on Elcho Rd. to LF-3C	-	3 crossings including Beaver and Parkers Creeks	1	4		Minor
	2. From QEW		5				Moderate
	Regional: south on Regional Rd. 18 (Beamsville Rd.); west on Regional Rd. 69 (Twenty Mile Rd.); south on Regional Rd. 569; south on Hwy 20; south on Regional Rd. 27	-	5 crossings including Spring, Parkers, 16 Mile and 20 Mile Creeks	6	11		
	Local: west on Elcho Rd. to LF-3C	-	3 crossings including Beaver and Parkers Creeks	1	4		Minor
	3. From QEW		3				Moderate
	Regional: south on Regional Rd. 14; south on Regional Rd. 714; east on Regional Rd. 73; south on Regional Rd. 14; south on Regional Rd. 16 to LF-3C	-	3 crossings of Beaver, 30 Mile, 20 Mile and North Creeks	12	15	Lake Ontario downstream near access from QEW	
	4. From QEW		5				Moderate
	Regional: south on Regional Rd. 18; west on Regional Rd. 69; south on Hwy. 20; south on Regional Rd. 27.	-	5 crossings including Spring, Parkers, 16 Mile and 20 Mile Creeks	6	11		
	Local: west on Elcho Rd. to LF-3C		3 crossings including Beaver and Parkers Creeks	1	4		Minor

TABLE 3 (cont'd.)

ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE PERMANENT	NO SENSITIVE USE INTERMITTENT	TOTAL NUMBER		
LF-3C (cont'd.)	5. From QEW Regional: south on Vineland Townline Rd. (Regional Rd. 24); west on Highway 20; west on Regional Rd. 65; south on Smithville Rd. to LF-3C	1 1 crossing 20 Mile Creek, Salmonids below escarpment	4 4 crossings including Parkers 15 Mile, 16 Mile and Beaver Creeks	26	31		Major
	6. From QEW Regional: south on Vineland Townline Rd. (Regional Rd. 24); west on Hwy 20; west on Regional Road 65	1 1 crossing 20 Mile Creek, Salmonids below escarpment	3 3 crossings including Beaver and Parkers Creeks	23	27		Major
	Local: south on Krick Rd. to LF-3C	-	1 1 crossing Parkers Creek	3	4		Minor
LF-9C	1. From QEW Regional: south on Vineland Twp. Rd. (Regional Rd. 24); west on Hwy. 20 to LF-9C	1 1 crossing of 20 Mile Creek, salmonids below escarpment	2 2 crossings including 15 Mile and 16 Mile Creeks	15	18		Major
	2. From QEW Regional: south on Regional Rd. 18; west on Regional Rd. 69; south on Regional Rd. 569; south on Hwy 20; east on Hwy 20 to LF-9C.	-	4 4 crossings including 16 Mile, 20 Mile and Spring Creeks	7	11		Moderate
	3. From QEW Regional: south on Regional Rd. 18; west on Regional Rd. 69; south on Hwy 20; east on Hwy 20 to LF-9C	-	4 4 crossings including 16 Mile, 20 Mile and Spring Creeks	7	11		Moderate
LF-1E	1. From QEW Regional: west on Regional Rd. 47 (Lyons Creek Rd.) south on Regional Rd. 98 (Montrose Rd.)	-	-	1	1	Tributary to Lyons Creek	No
	Local: west on Carl Rd. to LF-1E	-	-	1	1	Tributary to Lyons Creek	No

TABLE 3 (cont'd.)
ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE PERMANENT	NO SENSITIVE USE INTERMITTENT	TOTAL NUMBER		
LF-1E (cont'd.)	2. From QEW						
	Regional: west on Biggar Rd.	-	-	-	0		No
	Local: south on Morris Rd.	-	-	-	0		No
	3. From QEW						
	Regional: west on Biggar Rd.	-	-	-	0		No
	Local: south on Crowland Ave.	-	-	-	0		No
	4. From QEW						
	Regional: west on Biggar Rd.; south on Montrose Rd.	-	-	2	2		No
	Local: west on Young Rd.	-	-	1	1		No
	5. From QEW		1				
	Regional: west on Biggar Rd.; south on Montrose Rd.; west on Schisler Rd. (Regional Rd. 27)	-	1 crossing of Lyons Creek	3	4		Minor
LF-1E/PI-27E to PI-27E	1. From QEW						
	Regional: west on Regional Rd. 47 (Lyons Creek Rd./Biggar Rd.) to PI-27E	-	-	-	0		No
	2. From QEW						
	Regional: west on Regional Rd. 47; north on Regional Road 98 to PI-27E	-	-	1	1		No
PI-27E to LF-1E	1. To LF-1E from PI-27E						
	Regional: east on Biggar Rd. (Regional Rd. 47); south on Regional Rd. 98 (Montrose Rd.)	-	-	2 crossings of tributary to Lyons Creek	2		No
	Local: west on Carl Rd.	-	-	1	1		No

TABLE 3 (cont'd.)
ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE PERMANENT	NO SENSITIVE USE INTERMITTENT	TOTAL NUMBER		
PI-27E to LF-1E (cont'd.)	2. To LF-1E from PI-27E						
	Regional: west on Biggar Rd.	-	0	0	0		No
	Local: south on Morris Rd.	-	0	0	0		No
	3. To LF-1E from PI-27E						
	Regional: west on Biggar Rd.	-	0	0	0		No
	Local: south on Crowland Ave.	-	0	0	0		No
	4. To LF-1E from PI-27E						
	Regional: east on Biggar Rd.; south on Montrose Rd.	-	0	2	2		No
	Local: west on Young Rd.	-	0	1	1		No
	5. To LF-1E from PI-27E						
	Regional: east on Biggar Rd., south on Montrose Rd.; west on Schisler Rd. (Regional Rd. 27)	-	1 1 crossing of Lyons Creek	3	4		Minor
LF-2N/PI-1N	1. To PI-1N from 401		1				Minor
	Regional: south on Fourth Line Rd.; west on Britannia Rd. to PI-1N	-	1 crossing 16 Mile Creek	3	4		
To PI-1N	Local: south on Fourth Line Rd.	1 1 crossing 16 Mile Creek, salmonid fish migration	-	3	4		Major
	2. To PI-1N from 401	1					Major
	Regional: south on Fourth Line Rd.; west on Derry Rd.; south on Hwy. 25	1 crossing 16 Mile Creek, salmonid migration	-	6	7		

TABLE 3 (cont'd.)

ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE PERMANENT	NO SENSITIVE USE INTERMITTENT	TOTAL NUMBER		
PI-1N to LF-2N	1. To LF-2N from PI-1N		1				
	Regional: east on Britannia Road; north on Fourth Line Road; east on 401; north on Hwy. 10 to LF-2N	-	1 crossing 16 Mile Creek	8	9	Cross Credit River on 401; an important salmonid river	Major
	Local: north on First Line Rd.	1 crossing of 16 Mile Creek, salmonid migration	-	3	4		Major
	2. To LF-2N from PI-1N						
	Regional: west on Britannia Rd.; north on Tremaine Rd.; east on Steeles Ave.; north on Hwy 25; east on 401; north on Hwy 10 to LF-2N	-	1	16	17	Cross Credit River on 401; an important salmonid river	Moderate
LF-2N/ PI-13N To PI-13N	1. To PI-13N from 401						
	Regional: south on Fourth Line Rd.; east on Britannia Rd.	-	-	1	1		No
	Local: south on Fourth Line Rd.; south on Fifth Line Rd. to PI-13N	1 crossing 16 Mile Creek, salmonid fish migration	-	5	6		Major
	2. To PI-13N from 401						
	Regional: south on Fourth Line Rd.; east on Derry Rd.	-	-	2	2		No
	Local: south on Fourth Line Rd.; south on Fifth Line Rd. to PI-13N	-	-	5	5		Minor
	3. To PI-13N from 401						
	Regional: south on Trafalgar Rd.; west on Britannia Rd.	1 crossing 16 Mile Creek, salmonid fish migration	-	7	8		Major
	Local: south on Fifth Line Rd. to PI-13N	-	-	2	2		No

TABLE 3 (cont'd.)

ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE				
			PERMANENT	INTERMITTENT	TOTAL NUMBER		
PI-13N to LF-2N	1. To LF-2N from PI-13N	1					
	Regional: east on Britannia Rd.; north on Trafalgar Rd.; east on 401; north on Hwy 10 to LF-2N	1 crossing 16 Mile Creek, salmonid fish migration	-	12	13	Cross Credit River on 401, an important salmonid river	Major
	Local: north on Fifth Line Rd.	-	-	-	0		No
	2. To LF-2N from PI-13N						
	Regional: west on Britannia Rd.; north on Fourth Line Rd.; east on 401; north on Hwy 10 to LF-2N	-	-	3	3	Cross Credit River on 401, an important salmonid river	No
	Local: north on Fifth Line Rd. north on Fourth Line Rd.	1 crossing of 16 Mile Creek, salmonid fish migration	-	5	6		Major
	3. To LF-2N from PI-13N						
	Regional: west on Derry Rd.; north on Fourth Line Rd.; east on 401; north on Hwy. 10 to LF-2N	-	-	4	4	Cross Credit River on 401, an important salmonid river	No
	Local: north on Fifth Line Rd.; north on Fourth Line Rd.	1 crossing of 16 Mile Creek, salmonid fish migration	-	4	5		Major
	4. To LF-2N from PI-13N	3					
	Regional: east on Britannia Rd., north on Trafalgar Rd., east on Derry Rd. to LF-2N	3 crossings of 16 Mile Creek, Credit River, Fletchers Creek	-	23	26		Major
	Local: north on Fifth Line Rd.	-	-	-	0		No

TABLE 3
ANALYSIS OF ACCESS ROAD OPTIONS (STEP I)
PHASE 4A BIOLOGY

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS				REMARKS	CONSTRAINT
		SENSITIVE USE KNOWN	NO SENSITIVE USE				
			PERMANENT	INTERMITTENT	TOTAL NUMBER		
LF-4N/PI-1N To LF-4N	1. To LF-4N from 401	2	1				
	Regional: south on Fourth Line Rd., west on Britannia Rd.	2 crossings, trib. to Bronte Creek. 5 km+ warm water fishery	1 crossing 16 Mile Creek	6	9		Major
	Local: south on Fourth Line Rd.	1					
		1 crossing, 16 Mile Creek, salmonid fish migration	-	3	4		Major
	2. To LF-4N from 401	1					
	Regional: south on Fourth Line Rd.; west on Derry Rd.; south on Hwy 25; west on Britannia Rd.	1 crossing main branch 16 Mile Creek	-	10	11		Major

a "moderate constraint" rating was assigned. "Major constraint" status applied in instances where a stream with a known sensitive use was crossed.

Important fisheries represent sensitive uses and were defined as watercourses supporting salmonid runs or populations of warm water game fish within 5 km downstream of the crossing.

The information contained in Table 3 was used in the comparative evaluation of alternative access routes to a particular site to aid in the selection of a preferred route to a particular site.

2.3.3 STEP 2

Step 2 of the Phase 4A access road analysis was a more detailed assessment of road access options to certain sites. Options carried forward from Step 1 were analyzed. Access road maps are contained in Appendix C.

Transportation Impact on Fish Communities was the Step 2 biological factor. This factor is based on the OWMC goal of minimizing environmental impact. There are three indicators of this factor, "length of regionally significant fishery", "length of locally significant fishery" and "spill pathway index". All three recognize the potential for impacts on downstream fish populations and habitat in the event of an accidental spill of toxic waste along an access route. The first two factors were used in the Step 2 analysis and are described in greater detail in Section 2.3.3.4. The spill pathway index was used in a subsequent analysis of preferred options and is described in greater detail in Chapter 4.

2.3.3.1 Assumptions

Step 2 of the Phase 4A access route analysis was based on the following assumptions:

- the special wastes being transported are concentrated, toxic, and of low viscosity;
- spills of special wastes occurring along the length of an access route which passes through a flood plain ("stream crossing distance") may enter the surface water system;
- treated wastes being transported from a treatment plant/incinerator to a landfill are in a relatively inert, non-liquid state, and are assumed to pose no threat to downstream fisheries resources;
- streamflow will be insufficient to dilute spilled untreated wastes to a safe level until the wastes reach the ultimate receiving water body;
- Lake Ontario is considered to be the ultimate receiver for streams crossed by access routes to Sites LF-4N, PI-1N, and PI-13N, and the Niagara River for streams crossed by access routes to Sites LF-3C, LF-9C, LF-1E, and PI-27E.

2.3.3.2 Analytical approach

To complete a detailed assessment of access road options in Step 2, it was necessary to gather information concerning the

physical characteristics of the streams crossed by access routes (the "pathways" through which contaminants might move) and the downstream fisheries resources which would receive impacts associated with a spill of toxic waste.

Data on (1) the potential of waste spills occurring, some of which may enter the surface water system, and (2) significant downstream fisheries were obtained. A fishery constraint scale was determined for each option, which in turn formed the basis for the detailed comparative evaluation of alternative access routes.

2.3.3.3 Stream crossing distance

Stream crossing distance provides a measure of the potential of spills occurring, some of which may lead to waste entering surface waters. This distance is the length of access route within which there is a high potential of spilled waste entering a stream. The concept of and rationale for stream crossing distance is described in the Technical Appendix of the Phase 4A Surface Water Report (GLAL 1985b).

2.3.3.4 Fisheries significance

Data sources used to evaluate the fisheries significance of watercourses included published literature and government reports, discussions with agency personnel, data from local citizens on fish spawning and angling activity, and discussions with bait fishermen about significant baitfish harvest locations. Topographic maps and air photos were also used to interpret habitat conditions.

A specific change which resulted from the more detailed Phase 4A research was placing less reliance on the OMNR

(1973) map of trout and salmon migratory routes in southern Ontario streams. This map showed that extensive lengths of streams such as Sixteen Mile (Oakville) Creek were potential routes for salmonid runs. During Phase 3B, road options crossing these routes were accorded a major constraint rating. Since in certain cases, salmonid runs have not developed during the 12 years since the OMNR map was published, the probability of establishment of a major run is questionable. During Phase 4A, the fisheries significance of streams was determined on the basis of existing conditions. Thus, there may be differences in the constraint ratings applied to particular stream crossings in Phase 3B and 4A.

Data were organized in a working table in which sources and data entries were numbered and related to a 1:50,000 scale map overlay for each site or group of contiguous sites. These maps and tables are contained in GLAL files.

Fisheries data were generally in one of two forms. Much of the data was contained in OMNR Aquatic Inventory Records and pertained to information gathered at specific points. Other data were generalized, usually referring to entire lengths of a stream. If the available fish species data from two consecutive points along a water-course were similar, it was inferred that the intervening section of the stream also provided habitat for similar fish communities.

Boundaries of stream significance categories are based on the delineation of similar stream habitats from topographic maps (1:50,000) and available air photographs.

Although specific boundaries were delineated, some variation in boundaries may be anticipated on an annual and seasonal basis as a result of water quality and quantity changes and biological pressures and stresses.

Evaluation of the data was achieved by developing and assigning levels of significance to streams. The four stream significance categories assigned are: "regionally significant", "locally significant", "insignificant", and "no data". Descriptions of each category follow:

Regionally Significant

- All coolwater stream sections which presently support salmonid populations;

- All warmwater stream sections which serve as a migratory route for salmonid populations; and

- Any stream sections from which a rare, threatened or endangered fish species has been captured.

Locally Significant

- All warmwater stream sections which presently support a sports fish population or serve as a migration route for sports fish other than salmonids; and

- Any stream section which has, in the recent past, been utilized as a source of commercial bait fish.

Insignificant

- All stream sections which do not support a sports fish population or do not serve as a migration

route for sports fish; and

- Any stream section which has not, in the recent past, been utilized as a source of commercial bait fish.

No Data

- Generally small, intermittent streams which have not been inventoried by government agencies and are not known to contain fisheries of significance. These streams would be classified, in the main, as insignificant if data existed for them.

The rationale for the levels of significance assigned to various types of fisheries follows.

Stream watercourse categories were developed from a synthesis of ecological and recreational requirements and demands. All coolwater systems were designated as "regionally significant" because of the limited number of such environments in southern Ontario and the importance which the people of Ontario have attached to the preservation of these environments.

Warmwater systems containing sports fish were designated as "locally significant" because of the recreational value placed on angling opportunities by both the public and the provincial government. These systems were rated as less important than coolwater systems because of the large amount of such habitat available in southern Ontario. Warmwater stream sections were categorized as "regionally significant" if anadromous salmonid species resident in Lake Ontario utilized the section as a migration route.

The level of importance of these sections is also a reflection of recreational and ecological value.

Warmwater stream sections containing only coarse fish and common forage species were considered "locally significant" if a commercial bait fish operation utilizes the stream or if a warmwater sport fish population exists.

Stream sections were categorized as "insignificant" if no recreational or commercial interest was identified for the stream through the data analysis.

The significance categories assigned to sections of each stream are shown on 1:50,000 and 1:25,000 scale map overlays contained in GLAL working files.

For the purposes of the Step 2 evaluation, "insignificant" fisheries resource/"no data" stream reaches were not viewed as being of value in determining constraints posed by existing surface water uses. Thus, in the presentation of data and determination of a fishery constraint scale, only "locally significant" and "regionally significant" fishery stream lengths were used.

2.3.3.5 Stream lengths

Table 4 indicates the downstream length of significant fisheries for each access road option. Each stream crossing represents a point of potential waste entry. The total length (km) of regionally and locally significant fisheries for each access route is the sum of lengths downstream of crossings along a route. Distances were measured from the access road downstream to the ultimate receiving water body.

Table 4 (cont'd.)

ANALYSIS OF ACCESS ROAD OPTIONS (Step 2)

Phase 4A Biology

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS	LENGTH OF REGIONALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR REGIONALLY SIGNIFICANT FISHERY	LENGTH OF LOCALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR LOCALLY SIGNIFICANT FISHERY
LF-3C	1.* to LF-3C from QEW - south on Vineland Townline Road (Regional Road 24); west on Hwy.20; south on Regional Road 27; west on Elcho Road to LF-3C	32	109.1	-	344.2	Low
	6. to LF-3C from QEW - south on Vineland Townline Road (Regional Road 24); west on Hwy. 20, west on Regional Road 65 from Bismarck; south on Krick Road to LF-3C	33	109.1	-	373.9	High
LF-1E	1. from QEW - west on Regional Road 47 (Lyons Creek Road); south on Regional Road 98 (Montrose Road); west on Carl Road to LF-1E	2	0	Low	19.4	Low
	3. from QEW - west on Biggar Road; south on Crowland Ave. to LF-1E	1	0	Low	9.7	Low
	6.* from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Ave.; west on Carl Road to LF-1E	0	0	Low	0	Low

* PREFERRED ACCESS ROUTE OPTION FROM A SIGNIFICANT FISHERIES PERSPECTIVE

N/C - No Choice

NOTE: Options 4 and 5 to LF-1E were eliminated as a result of the boundary refinement exercise.

Table 4 (cont'd.)
ANALYSIS OF ACCESS ROAD OPTIONS (Step 2)
Phase 4A Biology

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS	LENGTH OF REGIONALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR REGIONALLY SIGNIFICANT FISHERY	LENGTH OF LOCALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR LOCALLY SIGNIFICANT FISHERY
LF-1E (cont'd)	7. from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road, west on Carl Road; south on Crowland Ave. to LF-1E.	3	0	Low	29.1	Medium
PI-27E/ LF-1E to PI-27E	1.* to PI-27E from QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road) to PI-27E	0	0	Low	0	Low
	2. to PI-27E from QEW - west on Regional Road 47, north on Regional Road 98 to PI-27E	1	0	Low	8.2	High
PI-27E to LF-1E	1. east on Regional Road 47 (Lyons Creek Road); south on Regional Road 98 (Montrose Road); west on Carl Road to LF-1E	2	0	Low	19.4	Low
	3. west on Biggar Road; south on Crowland Ave. to LF-1E	1	0	Low	9.7	Low
	6.* west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Ave.; west on Carl Road to LF-1E	0	0	Low	0	Low
	7. east on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Montrose Road; west on Carl Road; south on Crowland Ave. to LF-1E	3	0	Low	29.1	Medium

* PREFERRED ACCESS ROUTE OPTION FROM A SIGNIFICANT FISHERIES PERSPECTIVE

Table 4 (cont'd.)
ANALYSIS OF ACCESS ROAD OPTIONS (Step 2)
Phase 4A Biology

SITE	ACCESS ROUTE OPTION	NO. OF STREAM CROSSINGS	LENGTH OF REGIONALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR REGIONALLY SIGNIFICANT FISHERY	LENGTH OF LOCALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR LOCALLY SIGNIFICANT FISHERY
LF-4N/ PI-1N						
PI-1N to LF-4N	1. from PI-1N - north on Highway 25 (Bronte Road); west on Britannia Road to LF-4N	5	74.0	High	35.3	High
	2.* from PI-1N - north on First Line Road; west on Britannia Road to LF-4N	4	68.8	Low	27.6	Low

* PREFERRED ACCESS ROUTE OPTION FROM A SIGNIFICANT FISHERIES PERSPECTIVE

N/C - No Choice

Lake Ontario was considered to be the major receiver for streams crossed by access roads to Sites LF-2N, LF-4N, PI-1N, and PI-13N. The Niagara River was considered to be the major receiver for streams crossed by access roads to Sites LF-3C, LF-9C, LF-1E, and PI-27E.

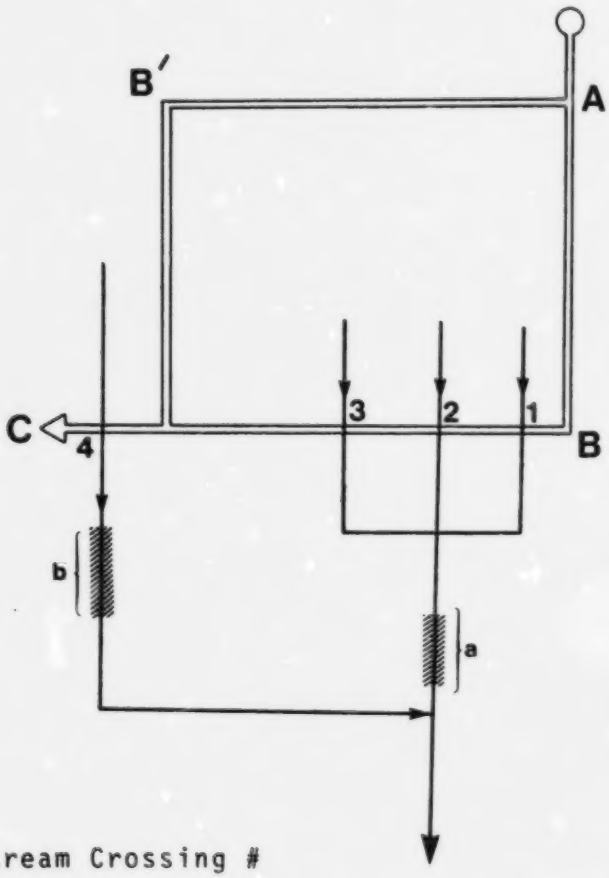
It is important to note that the numbers of stream crossings associated with access route options differ between the Step 1 and Step 2 analyses. The greater number of stream crossings recorded in Step 2 are the result of a change in map scale from 1:50,000 to 1:25,000. This change reflects the greater level of detail of the Phase 4A Step 2 analysis. Numbers of stream crossings used in the biology Step 2 analysis are consistent with those used in the surface water Step 2 analysis.

Figure 5 presents a schematic illustration of the methodology used to calculate downstream lengths of significant fisheries. In this hypothetical example two access route options, ABC and AB'C are being compared on the basis of potential impact to regionally significant fisheries.

Option ABC traverses streams at four separate locations (stream crossings 1, 2, 3 and 4). Each stream crossing represents a point of potential waste entry and a regionally significant fishery ("a" or "b") has been identified downstream of each crossing. Therefore the total amount of regionally significant fishery for this option is "3a" + b.

Option AB'C crosses a stream at one location (stream crossing 4) for which there is a regionally significant fishery

FIGURE 5: SCHEMATIC DIAGRAM SHOWING METHODOLOGY USED TO CALCULATE DOWNSTREAM LENGTHS OF SIGNIFICANT FISHERIES



LEGEND

2	Stream Crossing #
═	Access Road
○	Start
⇦	Finish
←	Stream
a	Significant Fishery

downstream ("b"). Therefore, the amount of regionally significant fishery subject to a potential impact is calculated as "b".

Lengths of regionally significant fisheries ("a" and "b") are assumed to be identical. Since there are four stream crossings along option ABC, as compared to only one along option AB'C, the amount of regionally significant fishery is four times greater, as is the potential for creating impacts.

2.3.3.6 Fishery constraint scale

A fishery constraint scale was determined for each access route option. The method for determining the fishery constraint scale and comparing options was based on the following:

- a scaling system was devised based on the range of values (lengths of "regionally"/"locally" significant fisheries) calculated for each access road option to a particular site. Comparisons were made only among options to a single site; and

- a three-level constraint scaling system was used: low, medium, and high.

Scaling was accomplished by assigning the range of values across the access road options to a particular site to one of three levels of potential impact. Levels of constraint have no absolute biological meaning. Rather, the levels represent relative levels among access route options to a particular site.

Initial comparisons were made among regionally signif-

icant fishery values. No constraint scale was assigned (see blanks in Table 4) in cases where only one option existed or where significant fishery values were greater than zero and similar for all options to a given site.

In cases where only two options existed, a high constraint scale was applied to the greater of the two values, a low constraint scale to the smaller of the two. For comparisons involving three or more options, the difference between the highest and lowest values was divided into three equal ranges of values. A high constraint was applied to values falling within the upper one-third, a medium constraint for the middle one-third, and a low constraint for the bottom one-third.

If no differences among regionally significant fisheries values existed (e.g. LF-3C, LF-1E, and PI-27E/LF-1E), a comparison of locally significant fisheries values was carried out in a similar fashion.

Fishery constraint scaling was used to determine the preferred access route (from a biological perspective) to a given site from among the options provided in Table 4. Biologically preferred options are indicated with an asterisk (*) following the option number.

GLAL's selection of preferred access routes from a biological perspective was subsequently assessed in conjunction with those of other consultants to determine overall preferred access routes for each siting option.

2.3.4 ACCESS ROUTES AND THE TERRESTRIAL ENVIRONMENT

It had been assumed at the outset of the Phase 4A access road assessments that there would not be a major potential impact on the terrestrial environment. It had been assumed that should a spill occur, speedy containment and clean-up would limit environmental impact.

As the Phase 4A study progressed it was determined that in a few locations road widenings and jog eliminations might be required along certain potential road access routes. Also, during factor clarification, the public expressed a concern about impacts on the terrestrial environment along access routes.

Potential existed for impact on trees, wildlife and habitat along a few access routes where road improvements might be required. The following factors were used to determine whether a potential for impact existed along the parts of access routes being assessed during Step 2 of Phase 4A:

- Significant Environmental Units (SEUs),
- Non-SEU Woodlots greater than 20 ha in area, and
- Significant Fish and Wildlife Features.

Data on the first two factors were collected during Phase 3B. These factors are described in Appendix V of the Phase 3B Biology Report (GLAL 1984). Data for the third factor were collected within the site vicinity study area during Phase 4A. This factor is described in Appendix A of this text.

Data available during Phase 4A were used to assess the six road improvement locations which Dillon-Transportation had identified.

Since there were no factor occurrences, the terrestrial biology factors were screened out and they are not documented further in the access road assessment.

2.4 RAIL ACCESS OPTIONS

2.4.1 INTRODUCTION

The provision of rail access to a candidate site was viewed as an opportunity rather than as an absolute requirement. The major benefits associated with the rail bulk haulage of process additives and reagents would be a reduction in road transport haulage and a reduction in the cost of transport of these materials to an integrated or partially integrated site.

The rail option evaluation involved two stages:

(1) constraint mapping
(2) comparative evaluation

Factors were different in the two stages, as described below. Rail access options are shown in Figures C16 through C21, Appendix C.

2.4.2 CONSTRAINT MAPPING

During constraint mapping, two biology factors were employed to assess broad corridors identified by the Dillon transportation consultant. Figures in "Site Selection Process Phase

4A: Selection of a Preferred Site(s) - Site Selection" Dillon (1985a) show the corridors assessed at a 1:10,000 scale.

The two biology factors used during constraint mapping were Significant Environmental Units (SEUs) and Non-SEU Woodlots greater than 20 ha in size. Factor sheets are contained in Appendix A.

These two factors originated during Phase 3B of site selection and the data base assembled at that time was used during the constraint mapping stage of rail corridor analysis.

Constraint mapping showing biology factor occurrences was prepared on overlays which were provided to M.M. Dillon. Study areas extended from the existing main line rail corridor to the acquisition boundary of sites.

The level of potential constraint was assigned on the basis of the significance of the factor which might be affected.

Rationale for scaling (assessment of relative impact level) during constraint mapping is as follows:

a) SEUs - high constraint

As in Phase 3B, SEUs are areas which have been identified as possessing important environmental functions. These areas represent potentially serious constraints.

Fragmentation of an SEU by a rail line is expected to create an environmental impact through habitat displacement.

b) Non-SEU Woodlots >20 ha in size - medium constraint
These areas hold potential for providing habitat for woodland species.

The level of constraint assigned to each factor occurrence was straightforward unless there were site-specific data to justify a different constraint rating. Displacement of SEUs was considered to represent a high (H) constraint and displacement of non-SEU woodlots larger than 20 ha was considered to represent a medium (M) constraint. Thus, each feature on the constraint maps was assigned an M or H rating.

Table 5 provides a qualitative description of biology factor occurrences within each site's rail corridor.

The site selection team used the biology data, along with data for other disciplines, to identify specific rail option alignments which warranted examination in more detail.

2.4.3 COMPARATIVE EVALUATION

The site selection team identified alternative rail alignment options as a result of the constraint mapping assessment. Reasons for the options chosen are outlined in "Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Site Selection" Dillon (1985a).

The comparative evaluation was designed to assess the alignments which had been identified during constraint mapping.

By the second step of rail studies, more detailed information from Phase 4A had been assembled. Results of Phase 4A

TABLE 5: CONSTRAINT MAPPING STAGE, RAIL ACCESS OPTION ANALYSIS - PHASE 4A BIOLOGY

SITE	FACTORS & DESCRIPTION OF OCCURRENCE & CONSTRAINT RATING					
	SEU	DISPLACE-MENT	CONSTRAINT RATING	NON-SEU WOODLOT >20 ha	DISPLACE-MENT	CONSTRAINT RATING
LF-2N to the west	• SEU 5-1 Sixteen Mile Creek-fish migration • SEU 4-4 Meadowvale Station Woods • SEU 4-1 Credit River Valley	X	H	Part of woodlot	X	M
PI-13N	• SEU 5-1 Sixteen Mile Creek-fish migration			Woodlot	X	M
PI-1N	-	-	-	-	-	-
LF-4N	-	-	-	-	-	-
LF-3C	• small part of SEU 18-10	X	H	-	-	-
LF-9C from N	• extreme E. end of SEU 18-4 Silverdale Woodlot	X	H	Woodlot in centre of range limit-ations from N	X	M
from E	• small part of SEU 18-9 • SEU 18-8 in centre of range limitation	X X	H H	-	-	-
LF-1E from N	• 1 portion of SEU 19-2	X	H	-	-	-
from W	• 3 portions of SEU 19-2			Part of woodlot	X	M
PI-27E	NO STUDY AREA OUTSIDE ACQUISITION LIMITS					

discussions with agency personnel, the public, naturalists and trappers which contributed to the site vicinity data base were available. No field work was required to complete a comparative evaluation of rail options.

In most cases, the rail option segments are contained entirely within the site vicinity envelope for which Phase 4A data had been collected. At LF-9C, however, certain options extend to the north and east, beyond the site vicinity. In this case, the Phase 3B data base was augmented by examination of 1:10,000 scale aerial photos to determine vegetation distribution patterns and locations of aquatic habitat.

Since a more detailed data set was available than during the constraint mapping stage, an additional biology factor was developed for the comparative evaluation of rail options.

Factors

Factors used in the comparative evaluation include:

- SEUs (Significant Environmental Units)
- Fish and Wildlife Features of Significance
- Non-SEU Woodlots >20 ha in size
- Rare Species

Details of definitions and the rationale for choosing these factors are outlined in the factor sheets (Appendix A). Simply put, these represent major biological considerations to be addressed.

The significance of SEUs and non-SEU woodlots has been discussed earlier in constraint mapping. Fish and wildlife features of significance include such occurrences as fish spawning areas, heronries, and deer wintering areas. These areas may be critical to sensitive periods during life histories and result in concentrations of animals. Habitat displacement or other disturbances of these areas would very likely create environmental impacts.

Finally, rare species are those plants and animals which have a limited population and distribution in an area. For example, species can be regionally, provincially or nationally rare. In some cases sensitivity to disturbance may have contributed to their rarity.

2.4.3.1 Impact prediction - level of constraint

The level of constraint associated with an option passing through or immediately adjacent to a factor occurrence is a function of two things:

(1) significance/sensitivity of the feature; and

(2) placement of the alignment relative to the factor location.

Feature-by-feature constraint evaluations were conducted. To provide the basis for making the constraint assessments, working overlay maps were prepared at a scale of 1:10,000. These showed:

- alternate alignments from mainline to acquisition

boundary derived by the site selection team during constraint mapping;

- factor occurrences within the rail alignments.

Relative levels of potential impact were assessed among options on the basis of the significance of the factors which might be affected. This impact assessment resulted in the assigning of constraint ratings. During the comparative evaluation a three-level constraint rating system was used: high, medium and low.

A better knowledge of the quality of woodlots, habitat and watercourses than was available during the constraint mapping stage developed during Phase 4A. This allowed better assessment of the degree of constraint associated with features along particular rail options. For example, at LF-3C there is a small wooded block between the main rail line and the western margin of the site. Although this unit is apparently part of SEU 8-10, it is a small, isolated fragment of a larger woodlot. We are aware of no specific reasons why this area should be considered to be significant. Impacts on this unit might pose only a medium level of constraint.

The constraint rating applied to each factor occurrence was marked on a 1:10,000 scale working map contained in GLAL files.

Table 6 describes the biology factor occurrences and associated levels of constraint for each option.

For Sites PI-1N and LF-4N there were no biology factor

Table 6

SITE LF-3C
PHASE 4A - Rail Access Options - Comparative Evaluation

FACTORS	OPTION I		OPTION II		OPTION III		OPTION	
	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint
SEUs	edge of a small portion of SEU 18-10 (Southwestern Elcho Forest)	M	-----	--	-----	--		
Non-SEU woodlots greater than 20 ha	-----	--	-----	--	-----	--		
Fish and Wildlife features of significance	-----	--	-----	--	-----	--		
Rare species	-----	--	-----	--	-----	--		

Table 6 (cont'd)

SITE LF-9C
PHASE 4A - Rail Access Options - Comparative Evaluation

FACTORS	OPTION I		OPTION II		OPTION III		OPTION IV	
	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint
SEUs	bisects top part of SEU 18-8 (Davison's Bush)	H	-------	--	bisects southern quarter of SEU 18-8 (Davison's Bush) bisects southern 1/3 of SEU 18-9 (Comfort's Bush)	H H	passes thru eastern edge of SEU 18-4 (Silverdale Woodlot this part is separated from main SEU	M
Non-SEU woodlots greater than 20 ha	-------	--	-------	--	-------	--	cuts off small part of woodlot	M
Fish and Wildlife features of significance	crosses Sucker Creek which supports pike spawning	M	crosses Sucker Creek which supports pike spawning	M	crosses Sucker Creek which supports pike spawning	M		
Rare species		M	-------	--	rare plant displaced by rail alignment	M	-------	--

Table 6: (cont'd.)

SITE LF-9C
PHASE 4A - Rail Access Options - Comparative Evaluation

FACTORS	OPTION V		OPTION		OPTION		OPTION	
	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint
SEUs	passes through extreme eastern edge of SEU 18-4 (Silverdale Woodlot), this unit is already separated from the more extensive forest to the west, by a road and clearings	M						
Non-SEU woodlots greater than 20 ha	cuts through western edge of ca. 20 ha woodlot	M						
Fish and Wildlife features of significance								
Rare species	-----	--						

Table 6 (cont'd.)

SITE LF-1E
PHASE 4A - Rail Access Options - Comparative Evaluation

FACTORS	OPTION I		OPTION II		OPTION III		OPTION IV	
	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint	Factor Occurrence	Level Of Constraint
SEU	Option is within site acquisition boundary	--	Passes along E. edge of a part of SEU 19-2 (Horse Track Woodlot)	L	Option is within site acquisition boundary	--	Option is within site acquisition boundary	--
Non-SEU woodlots greater than 20 ha	-----	--	-----	--	-----	--	-----	--
Fish and Wildlife features of significance	-----	--	-----	--	-----	--	-----	--
Rare species	-----	--	-----	--	-----	--	-----	--

occurrences associated with the rail options. At Site PI-27E the rail options were located within the site acquisition boundary. Thus, there were no factor occurrences associated solely with the rail options.

Table 7 indicates the ranking of options in order of preference for each site. Reasons for the ranking are presented in Table 8. In most instances the preferred and least preferred options were obvious upon comparison of the number and levels of constraint occurrences. Professional judgement was used to make decisions where a mix of constraints occurred.

The rare species factor contributed little to the detailed evaluation since there were no instances in which alignments displaced rare species.

In Chapter 4 the significance of impacts associated with providing rail access to OWMC facilities is addressed in a sensitivity analysis.

TABLE 7: RANKING OF RAIL OPTIONS

BIOLOGY FACTORS

SITE	RAIL ACCESS OPTIONS				
	I	II	III	IV	V
LF-1E	1	2	1	1	-
LF-3C	2	1	1	-	-
LF-9C	4	1	5	2	3
LF-4N	1	1	2	1	-
PI-1N	1	1	1	2	-

Note: Rank 1 is the preferred option from a biological perspective.

TABLE 8: RATIONALE FOR SITE RANKINGS CONTAINED IN TABLE 7

LF-1E

- Options I, III and IV fall within the site acquisition boundary. Since these create no "off-site" impacts, they are equal, preferred options.
- Option II passes along the eastern edge of SEU 18-2, (a low constraint).

LF-3C

- Options II and III have no constraints, thus they are preferred.
- Option I is least preferred because it would pass through the small, isolated portion of SEU 18-10 (a medium constraint).

TABLE 8 (cont'd)

LF-9C

- Option II is preferred because the only constraint is a medium one, involving a crossing of Sucker Creek.

- Options IV and V are very similar. Both bisect the extreme eastern edge of SEU 18-4 and pass through a larger Non-SEU Woodlot, The constraint ratings assigned to the various factor occurrences are equal. However, Option IV is preferred over Option V because Option V would involve the displacement of a larger portion of a Non-SEU Woodlot than Option IV.

- Option I bisects an SEU (a high constraint) and crosses Sucker Creek (a medium constraint).

- Option III is least preferred because two SEUs will be affected (both a high constraint), Sucker Creek will be crossed (a medium constraint), and a rare plant will be displaced by the proposed rail alignment (a medium constraint)

LF-4N

- There are no factor occurrences, but an examination of natural vegetation patterns led us to the conclusion that Option III is less desirable than the other three options.

PI-1N

- There are no factor occurrences, but an examination of natural vegetation patterns led us to conclude that Option IV is less desirable than the other three options.

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2.5 LOCATION OF PHYSICAL-CHEMICAL TREATMENT PLANT - PARTIALLY INTEGRATED OPTIONS

2.5.1 INTRODUCTION

Among the siting options, there are three categories of facilities configurations. A fully integrated facility option involves a landfill, a physical/chemical treatment plant and an incinerator all located on one site. A partially integrated facility option has two sites and involves the choice of locating the physical/chemical treatment plant with the landfill site or with the incinerator site.

The specific siting options involved in this comparison were:

1. PI-27E/LF-1E
   (i) the incinerator and physical/chemical treatment plant at PI-27E and a landfill at LF-1E; or

   (ii) the incinerator at PI-27E and the landfill and physical/chemical treatment plant at LF-1E;

2. PI-13N/LF-4N
   (i) the incinerator and physical/chemical treatment plant at PI-13N and the landfill at LF-4N; or

   (ii) the incinerator at PI-13N and the physical/chemical treatment plant and landfill at LF-4N.

3. PI-1N/LF-4N
   (i) the incinerator and physical/chemical treatment plant at PI-1N and the landfill at LF-4N; or

(ii) the incinerator at PI-1N and the landfill and physical chemical treatment plant at LF-4N.

Options involving Site LF-2N were not assessed since this site had been dropped by the site selection team during the basic acceptability screen, see Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Site Selection (Dillon, 1985a).

2.5.2 SITE ASSESSMENT

The site and access road study areas might be most directly affected by the choice of physical/chemical treatment plant location.

The number and type of facility components constructed on the site dictates area requirements and influences the degree of flexibility available in siting facilities to avoid constrained portions of sites.

During the Phase 4A assessment, it was assumed that facility development would displace biological resources on the entire site. Despite this assumption, for purposes of providing input to the assessment of physical/chemical treatment plant placement, we considered the possibility that the different areas required for facility components may allow some flexibility in siting to avoid biological constraints. The incinerator alone covers approximately 10.7 ha; when combined with the physical/chemical plant, 17.7 ha are required.

If the physical/chemcial plant is placed with the incinerator near the centre of the site, less than 20 ha are

required. There may be potential for avoiding biological constraints which exist on the remaining site lands.

If the physical/chemical plant is placed with the landfill presumably the entire site will be developed. The landfill area would be reduced by approximately 10.2 ha to accommodate the physical/chemical plant.

Until detailed designs of the facility layout are completed and details of the location of biological features are known, the specific impacts of facility placement cannot be determined. The following suggestion, however, is based on a generic assessment of the two options for physical/chemical plant placement:

- there is greater potential for displacement of natural features on the site where the physical/chemical plant is located, since more site area will be occupied by facilities.

- locating the physical/chemical plant with the incinerator occupies a small proportion of the entire site; assuming minimal disturbance of the land for drainage control and servicing, constraint features could be avoided or retained on the rest of the site surrounding these facilities;

- locating the physical/chemical plant with the incinerator would provide a slight opportunity to avoid significant features on the site where the landfill is placed. This assumes that the entire site is not required for landfill

and that the configuration of the landfill and type of features present allow viability of the features.

Because of the above it was concluded that the physical/chemical plant should be placed with the incinerator to increase the opportunity to avoid biological resources. This assessment should be re-assessed on a site-specific basis if a partially integrated facility were chosen as the preferred siting option.

2.5.3 ACCESS ROAD ASSESSMENT

Figure 6 is a schematic diagram which indicates the significance of physical/chemical plant placement relative to waste, additive and reagent transport. In Option 2, where the physical/ chemical plant is located with the landfill, special wastes are transported to both the incinerator and the physical/chemical plant. If the physical/chemical plant is placed with the incinerator there is only one series of movements involving special waste.

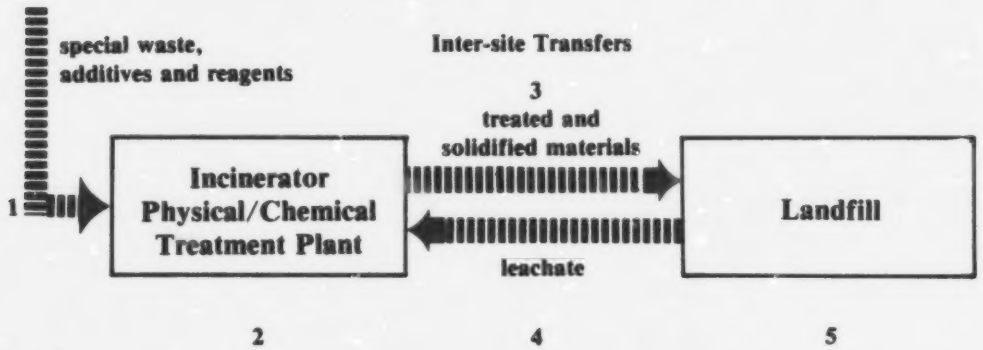
From an inter-site transport perspective, leachate is the only waste transported between sites in Option 1, whereas, both recovered oil and residues for treatment are moved between sites in Option 2.A generic assessment would conclude that Option 1, incinerator with the physical/chemical plant, would appear to reduce the potential for spills of transported waste.

Fish communities downstream of access roads were considered to be the biology factor of most significance relative to transportation and physical/chemical plant placement.

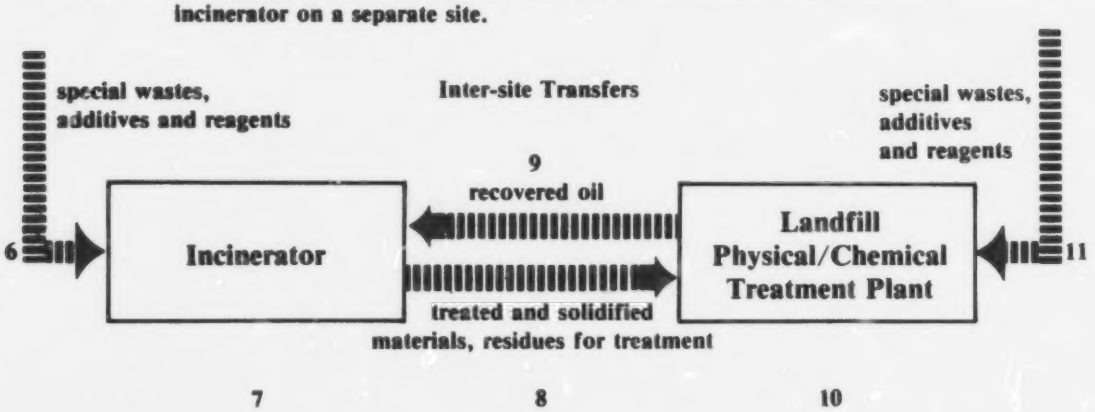
FIGURE 6

SCHEMATIC OF PARTIALLY INTEGRATED SITING OPTIONS

OPTION 1: The physical/chemical treatment plant with the incinerator and the landfill facility on a separate site.



OPTION 2: The physical/chemical treatment plant with the landfill facility and the incinerator on a separate site.



LEGEND

1 = access route for transporting - special waste, additives and reagents to the physical/chemical treatment plant
2 = site of the incinerator and the physical/chemical treatment plant
3 = inter-site transfer route for the treated and solidified materials from the incinerator and physical/chemical treatment plant to the landfill facility
4 = inter-site transfer of leachates from the landfill to the incinerator and physical/chemical treatment plant
5 = site of the landfill facility
6 = access route for transporting special wastes and additives and reagents to the incinerator
7 = incinerator site
8 = inter-site transfer route for transporting treated and solidified materials and residues for treatment from the incinerator to the landfill facility and physical/chemical treatment plant
9 = transfer route for transporting recovered oil from the physical/chemical treatment plant to the incinerator
10 = site of the physical/chemical treatment plant and the landfill facility
11 = access route for transporting special waste, additives and reagents to the physical/chemical treatment plant.

It was concluded that potential for impact of fish communities downstream of access routes would be minimized if only one series of untreated waste movements existed. This could be achieved by placing the physical/chemical plant with the incinerator.

An overview of numbers of stream crossings and the downstream length of significant fishery associated with streams crossed by preferred access routes revealed that Option 1 is slightly preferred to Option 2 for the two northern siting options. For LF-1E/PI-27E there are no crossings of streams containing significant fisheries so there is no preference for one option over the other.

3.0 COMPARATIVE EVALUATION OF SITING OPTIONS

3.1 INTRODUCTION

Table 9 lists which facilities would be placed on specific sites.

TABLE 9: FACILITY PLACEMENT - PHASE 4A SITING OPTIONS

Siting Option	Facility Placement
LF-4N/PI-1N	LF-4N - landfill PI-1N - phys/chem* and incinerator
LF-4N/PI-13N	LF-4N - landfill PI-13N - phys/chem and incinerator
LF-3C	totally integrated
LF-9C	totally integrated
LF-1E	totally integrated
LF-1E/PI-27E	LF-1E - landfill PI-27E - phys/chem and incinerator

* phys/chem = physical/chemical treatment plant

The three principal study areas used in siting option comparisons are the site, site vicinity, and access routes. Separate factors and indicators were established for these study areas.

Factors are positive or negative considerations which assist in comparing siting options. The factors refer to risks, impacts or engineering cost considerations. Factors are subdivided into indicators. Indicators are ways of more precisely identifying, describing and predicting risks, impacts and engineering concerns.

Since factors and indicators were selected prior to data collection, it was not possible to predict the quality and quantity of data which would be available for each indicator. Furthermore, the quality of the data would influence its value in decision-making.

Chapters 3.2 and 3.7 describe the iterative process which led to refinement of factors and indicators as data analysis began.

Technical appendices (provided separately) document resources within the site boundaries (acquisition limits) which were delineated at the end of Phase 3B. The site vicinity study area surrounds the site and is described in Chapter 3.3.

Prior to undertaking comparisons of conditions in the site and site vicinity study areas, boundary refinement occurred. The area of land required to accommodate facilities and associated buffer zones (the site) was less than that encompassed by the Phase 3B acquisition limit for Sites PI-1N, LF-3C, and LF-1E. The land which was eliminated from those three original candidate sites was added to the site vicinity.

In the case of PI-27E the TH & B railway corridor forms a distinct separation between the two parts of the site. Since no vegetation clearing or drainage works are required north of the railway corridor we have considered the northern half of Site PI-27E to be site vicinity.

Because of the above changes, the site areas of these four candidate sites have been reduced and the site vicinity areas have increased. It is these revised areas and associated resources that are compared in Chapters 3.2 (sites) and 3.3 (site vicinity).

Data used in the comparative analysis of site and site vicinity study areas are extracted from summary tables (Tables 2 and 4), contained in Technical Appendices.

The analytical procedure insured that no duplication (or "double-counting") of factors or indicators occurred among various study team disciplines and that only the most meaningful data were applied in comparing sites.

The procedure involved documenting biological resources for each site and site vicinity. The three steps leading up to indicator application were: screening, scaling and aggregation.

SCREENING - is a review process designed to identify indicators for which there are no data values, no differences among options, insignificant impacts or duplication of issues. Indicators remaining after screening can be used to make comparisons.

SCALING - is the conversion of data to units of desirability, such as high, medium or low.

AGGREGATION - is accomplished by combining measures of potential impact with weights which reflect the relative importance of indicators or factors.

Discussion of the evaluations of site and site vicinity indicators are provided separately in Chapters 3.2 and 3.3, respectively.

3.2 SITE IMPACT PREDICTION

3.2.1 SITE INDICATOR SCREENING

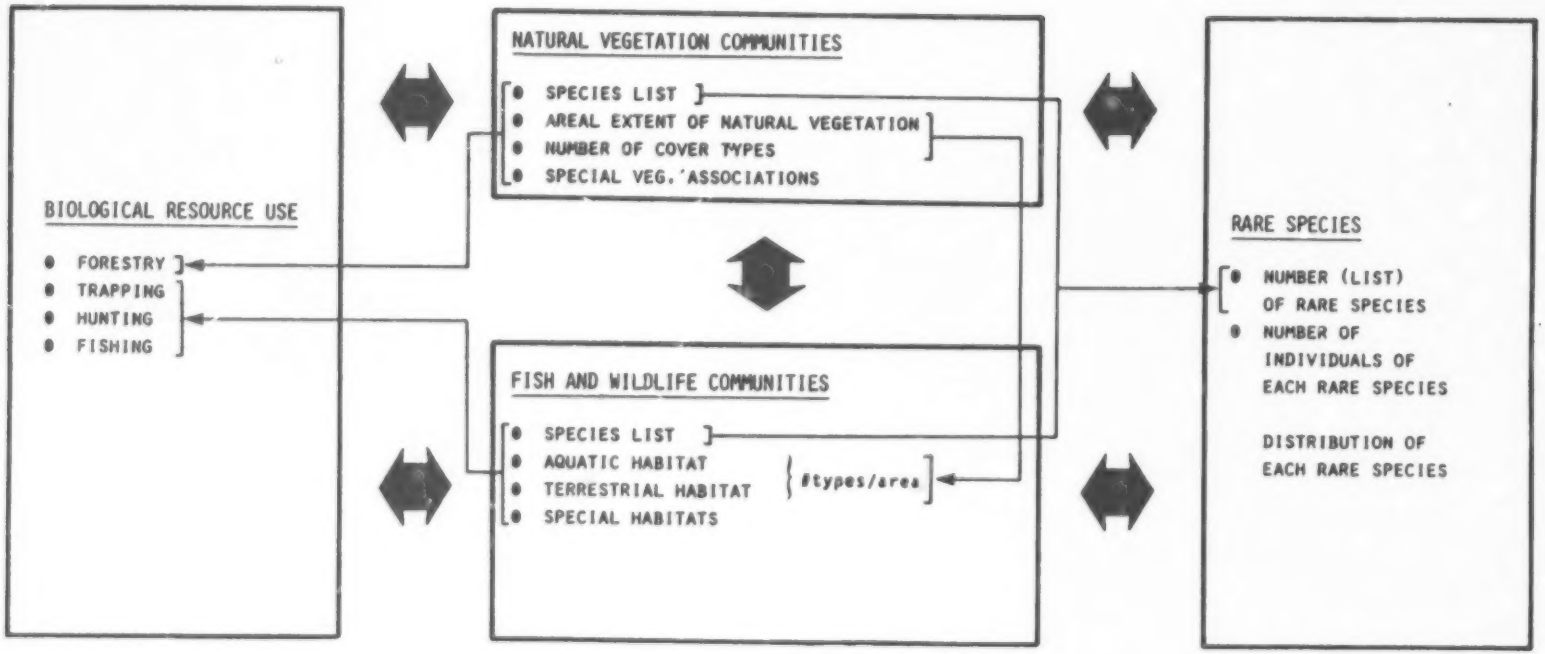
Site data matrices were examined to determine which indicators should be screened out. Also, a network diagram (Figure 7) was prepared which illustrates interrelationships among indicators.

Table 10 summarizes the reasons for dropping the following indicators:

- species lists
- forestry
- trapping
- hunting
- fishing

Because of overlap, a number of indicators and factors were re-assessed and re-organized. The indicators involved included:

FIGURE 7: SITE FACTOR/INDICATOR INTERRELATIONS - BIOLOGY



- number of vegetation cover types
- special vegetation associations
- aquatic habitat
- terrestrial habitat
- special habitats

This evaluation was done to avoid "double counting" of habitat-related indicators.

Two indicators under the rare species factor could not be used at this stage. The number of individuals and distribution of each rare species cannot be described in detail in a matrix format. Mapping associated with the Technical Appendix for each site illustrates the known distribution of rare species.

TABLE 10: SITE INDICATORS ELIMINATED DURING SCREENING

INDICATOR	RATIONALE FOR ELIMINATION
• Species list (from both vegetation and fish and wildlife communities factors)	• the number of species and content of the species lists are not useful for comparisons because the data base varies among the sites (due to sampling effort and observer skill re: public input). • species lists provided a data set from which significant species occurrences were carried forth in the rare species indicators.

TABLE 10 (cont'd)

• Forestry	• not a significant resource base, therefore, not a significant impact issue; of local significance only, of consequence primarily to landowners who would be displaced; Data review indicated no or low level existing use.
• Trapping	• not a significant resource base in an area the size of a site; not a significant impact issue; generally only of local consequence primarily to landowners or neighbours who are allowed to use the resource; data review indicated trapping activity on sites similar to extensive areas surrounding sites.
• Hunting	• not a significant resource base, not a significant impact issue, use only of local significance, many sites support no or minor level of existing activity.
• Fishing	• not a significant resource base in an area the size of a site, not a significant impact issue, use only of local significance, many sites exhibit no or minor level of existing activity.

****

For the purposes of the detailed comparative evaluation, the variety of rare species which might be affected by facility development was considered.

Table 11 lists the factors and indicators which resulted from the screening process.

Table 12 explains why factors and indicators were combined to yield "applied" factors. Applied factors are those which were used to compare siting options following factor and indicator screening.

TABLE 11: LIST OF APPLIED FACTORS AND INDICATORS

APPLIED FACTORS	INDICATORS
Rare species	• number of high, medium, low significance rare plant species
	• number of high, medium, low significance rare animal species (assess plants and animals separately because animals are mobile and may avoid direct elimination)
Natural vegetation	• number of hectares of natural vegetation displaced
Potential for occurrence of other significant biological features	• estimated level of potential for occurrence

****

TABLE 12: IDENTIFICATION OF APPLIED FACTORS AND INDICATORS

FACTOR/INDICATOR	DISCUSSION AND RATIONALE
Rare species	• used as an applied factor • habitat displacement would create direct impacts on certain rare species, especially plants. • the number of rare species which would be displaced and the significance level of these rare species will be used to compare siting options.

Natural vegetation - area displaced	• the following indicators overlap with and contribute to the natural vegetation factor:
	  • number of cover types
	  • special vegetation associations
	  • terrestrial habitat
	  • special habitats
	• several indicators would not have assisted in decision making, e.g. most sites had 6, 7 or 8 cover types, few had special vegetation associations, and where special habitats occurred they were of a similar type across the sites.
	• as a result of Phase 3B screening, few candidate sites appear to possess significant vegetation complexes; area of vegetation displaced provides a basic measure of impact on site vegetation.

TABLE 12 (cont'd)

	• note that rare plants are considered within the rare species factor.
Potential for occurrence of other significant biological features	• although Phase 4A field work provides an adequate base for comparing the biological conditions on candidate sites, it is advisable to consider the potential for occurrence of species and functions which have not yet been documented.
	• certain sites have a higher likelihood of providing habitat for rare species than do others, by virtue of their location, water and vegetation patterns on site and in surrounding areas.
	• by considering potential for occurrence of significant features during Phase 4A, a better prediction of ultimate site "suitability" can be achieved from a biological perspective.
	• this applied factor makes use of the aquatic habitat and terrestrial habitat indicator data.
	• level of potential (high, medium, low).

****

The analysis is focused on siting options which provide conditions suitable for the physical/chemical treatment plant, the incinerator and an engineered landfill.In the partially integrated siting options, two sites must be combined to offer siting for the physical/chemical treatment plant, incinerator and landfill.

Table 13 contains a summary of data for the siting options considered during Phase 4A. The data are presented on the basis of the applied factors. Data are for sites as defined following boundary refinement. For partially integrated siting options, (where two sites are required to house all of the facilities), data for both options are combined. Data are from summary matrices in the technical appendices for each site.

3.2.2 BASIC ACCEPTABILITY

A review of the relative rank of site and site vicinity factors, a preliminary analysis of Phase 4A data on site and site vicinity factors, and a basic acceptability review were completed to determine whether any study areas had serious constraints. This step was completed to determine if there were reasons for rejection of any sites prior to beginning the comparative evaluation of siting options.

An example of a possible unacceptable situation from a biological perspective would be the on-site confirmation of rare species which are listed in the Endangered Species Act (Ontario Government 1971).

A review of the Phase 4A data set (Table 13) revealed no evidence of occurrences which would indicate that any of the

TABLE 13: BIOLOGY INDICATOR DATA FOR SITING OPTIONS-SITES

INDICATOR	SITING OPTION			
	LF-3C	LF-9C	LF-1E	LF-1E/PI-27E
• Rare plants	4 rare species	6 rare species	5 rare species	8 rare species, 2 species occur on both sites
• Rare animals	1 rare species	5 rare species	1 rare species	1 rare species
• Natural vegetation displaced	approximately 78 ha	approximately 61 ha	approximately 55 ha	approximately 83 ha, on 2 sites combined
• Potential for occurrence of significant features	moderate to high potential	low potential	high potential	high potential
INDICATOR	LF-2N/PI-1N	LF-2N/PI-13N	LF-4N/PI-1N	LF-4N/PI-13N
• Rare plants	2 rare species on PI-1N	1 rare species on PI-13N	13 rare species on LF-4N, 2 rare species on PI-1N, one species occurs on both sites	13 rare species on LF-4N, 1 rare species on PI-13N 1 species occurs on both sites
• Rare animals	none	3 rare species on PI-13N	none	3 rare species on PI-13N
• Natural vegetation displaced	approximately 61 ha, on 2 sites combined	approximately 13 ha, on 2 sites combined	approximately 67 ha, on 2 sites combined	approximately 59 ha, on 2 sites combined
• Potential for occurrence of significant features	low potential	low potential	low potential	low potential

site or site vicinity study areas are unacceptable for OWMC facility siting from a biology perspective.

The hydrogeologic basic acceptability assessment led to the rejection of Site LF-2N, see Dillon (1985c). Following the basic acceptability analysis by the site selection team, six siting options were carried forward for further evaluation. These were:

- LF-4N/PI-1N
- LF-4N/PI-13N
- LF-3C
- LF-9C
- LF-1E
- LF-1E/PI-27E

3.2.3 INDICATOR SCALING

3.2.3.1 Introduction

Scaling transformed numbers of occurrences and areal extent of significant features to units of desirability ranging from most to least desirable. A three-level scaling system was used as follows:

high - major potential impact
medium - moderate potential impact
low - minor or positive impact

Scaling was accomplished by assigning the range of data points obtained across the siting options for a particular study area to one of the three levels of potential impact. It is important to note several key issues:

(1) the levels of impact are not absolute but represent relative levels among sites;

(2) because the scaling levels are only relative levels of impact among the data for candidate sites, the scale values do not have biological significance in an absolute sense;

(3) these impacts are assessed relative to impacts associated with other development undertakings, in Chapter 4.0; and

(4) natural systems involve interacting components; thus, results of analytical procedures which express biological functions as separate unrelated factors must be evaluated to ensure that the results are consistent with professional opinion.

3.2.3.2 Rare species significance levels

As part of the effort to determine the relative impact of siting options, it is necessary to assess the significance of rare species occurrences individually.

The geographic distribution of a species is a consideration in determining rarity significance. Regional differences may be evident in the significance of occurrence of a particular species.

For birds, breeding evidence increases the level of significance of a species occurrence. A rare migrant is not expected to have the same degree of dependence on the type of sites being assessed that a rare breeding species would.

The level of confidence placed in rare species reports not confirmed by GLAL observations, was another factor in assigning significance to an occurrence.

A series of working tables were developed in which the significance levels for rare species were determined. These tables are in Gartner Lee working files.

Table 14 summarizes the number of plant and animal species which were assigned to high, medium and low significance levels. Scaling of rare species occurrences was based on the number of rare species occurrences and their significance levels (see Table 13).

In Table 15 the combinations of rare species significance levels and other indicator data levels were reviewed and assigned relative impact levels (scaling levels).

Table 16 contains the site indicator scale results for the siting options. Indicator values are for entire site areas, after boundary refinement analysis.

3.2.3.3 Sensitivity analysis natural vegetation

Table 13 contains data on the total area of natural vegetation associated with siting options. The "recently disturbed field" cover type was included in this total. This cover type was assigned to areas which had experienced such disturbances as cropping or forest clear cutting in the recent past. Assuming further disturbances do not occur, the vegetation will progress to that associated with old fields.

TABLE 14: SIGNIFICANCE LEVELS OF RARE SPECIES - SITE*

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-3C	Golden Seal	M	Plants:
	Pin Oak	L	1 Medium
	Southern Arrow-wood	L	3 Low
	Tupelo	L	
	Eastern Bluebird	L	Animals:
			1 Low
LF-9C	Big Shellbark Hickory	H	Plants:
	Blunt-leaved Sandwort	H	2 High
	Pin Oak	L	4 Low
	Southern Arrow-wood	L	
	Spray Aster	L	Animals:
	Tupelo	L	1 High
	Black Rat Snake	H	1 Medium
	Bobcat	L	3 Low
	Eastern Bluebird	L	
	Opossum	L	
	Orchard Oriole	M	
LF-1E	Goldenrod	L	Plants:
	Pignut Hickory	L	6 Low
	Pin Oak	L	
	Southern Arrow-wood	L	Animals:
	Spray Aster	L	1 High
	Tupelo	L	1 Low
	American Badger	H	
	Opossum	L	
LF-1E/PI-27E	Goldenrod	L	Plants:
	Pignut Hickory	L	2 High
	Pin Oak	L	1 Medium
	Southern Arrow-wood	L	6 Low
	Spray Aster	L	
	Tupelo	L	Animals:
	Brookweed	M	1 High
	Many-fruited Ludwigia	H	1 Low
	Swamp Rose Mallow	H	
	American Badger	H	
	Opossum	L	

*NOTE: For all rare species occurring within Phase 3B Acquisition Boundaries

The level of confidence placed in rare species reports not confirmed by GLAL observations, was another factor in assigning significance to an occurrence.

A series of working tables were developed in which the significance levels for rare species were determined. These tables are in Gartner Lee working files.

Table 14 summarizes the number of plant and animal species which were assigned to high, medium and low significance levels. Scaling of rare species occurrences was based on the number of rare species occurrences and their significance levels (see Table 13).

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	Pin Oak	L	1 Medium
	Southern Arrow-wood	L	3 Low
	Tupelo	L	
	Eastern Bluebird	L	Animals:
			1 Low
LF-9C	Big Shellbark Hickory	H	Plants:
	Blunt-leaved Sandwort	H	2 High
	Pin Oak	L	4 Low
	Southern Arrow-wood	L	
	Spray Aster	L	Animals:
	Tupelo	L	1 High
	Black Rat Snake	H	1 Medium
	Bobcat	L	3 Low
	Eastern Bluebird	L	
	Opossum	L	
	Orchard Oriole	M	
LF-1E	Goldenrod	L	Plants:
	Pignut Hickory	L	6 Low
	Pin Oak	L	
	Southern Arrow-wood	L	Animals:
	Spray Aster	L	1 High
	Tupelo	L	1 Low
	American Badger	H	
	Opossum	L	
LF-1E/PI-27E	Goldenrod	L	Plants:
	Pignut Hickory	L	2 High
	Pin Oak	L	1 Medium
	Southern Arrow-wood	L	6 Low
	Spray Aster	L	
	Tupelo	L	Animals:
	Brookweed	M	1 High
	Many-fruited Ludwigia	H	1 Low
	Swamp Rose Mallow	H	
	American Badger	H	
	Opossum	L	

*NOTE: For all rare species occurring within Phase 3B Acquisition Boundaries

TABLE 14: SIGNIFICANCE LEVELS OF RARE SPECIES - SITE (cont'd.)

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-4N/PI-1N	Carex amphibola	M	Plants:
	C. brunnescens	M	14 Medium
	C. canescens	M	
	C. grayi	M	
	C. scoparia	M	
	Adder's-tongue	M	
	Buttonbush	M	
	Chokeberry	M	
	Highbush Blueberry	M	
	Marsh St. John's-wort	M	
	Rough Hair Grass	M	
	Swamp Rose	M	
	Wild Gooseberry	M	
	Black Snakeroot	M	
LF-4N/PI-13N	Carex amphibola	M	Plants:
	C. brunnescens	M	13 Medium
	C. canescens	M	
	C. grayi	M	
	C. scoparia	M	
	Adder's-tongue	M	Animals:
	Buttonbush	M	3 Low
	Chokeberry	M	
	Highbush Blueberry	M	
	Marsh St. John's-wort	M	
	Rough Hair Grass	M	
	Swamp Rose	M	
	Wild Gooseberry	M	
	Whip-poor-will	L	
	West Virginia White	L	
	Snout Butterfly	L	

TABLE 15 : INDICATOR SCALING SYSTEM FOR SITE [1]

INDICATOR	SITING OPTION DATA RANGES	SCALE LEVEL	RATIONALE
Number of high, medium, and low significance rare plant species	2, 1, 5 * 2, 0, 4	High	• high significance rare plant species occur • high constraint in relative terms
	0, 14, 0	Medium	• thirteen or more medium significance rare plant species occur • medium constraint in relative terms
	0, 1, 3 0, 0, 5	Low	• few rare species • low or medium significance species • low constraint in relative terms
Number of high, medium, and low significance rare animal species	1, 1, 3	High	• high significance rare animal species occur • high constraint in relative terms
	0, 0, 3	Medium	• medium constraint in relative terms
	0, 0, 1 0, 0, 0	Low	• fewest low significance rare animal species • low constraint in relative terms
Number of hectares of natural vegetation displaced	83	High	• greatest area • high constraint in relative terms
	67, 75	Medium	• middle of range of data values • medium constraint in relative terms
	55, 59, 61	Low	• lowest values in data range • values are similar • low constraint in relative terms
Level of potential for occurrence of significant features	High	High	• assume that if there is a high potential for finding other rare species, for example, that potential for impact associated with site development is also high.

[1]Note: Data presented is for site area after boundary refinement

TABLE 15: (cont'd)

INDICATOR	SITING OPTION DATA RANGES	SCALE LEVEL	RATIONALE
Level of potential for occurrence of significant features	Medium	Medium	• assume that if there is a medium potential for finding other rare species, for example, that potential for impact associated with site development is also medium
	Low	Low	• assume that if there is a low potential for finding other rare species, for example, that potential for impact associated with site development is also low

* 2, 1, 5 means 2 high, 1 medium and 5 low significance rare plant species

Note: Assume everything occurring within the site boundary is displaced, no avoidance, no mitigation

TABLE 16: SITE BIOLOGY - INDICATOR SCALING AND RATIONALE

INDICATOR	SITE LF-4N/PI-1N		SITE LF-4N/PI-13N	
	SCALE	RATIONALE	SCALE	RATIONALE
• Rare plants	M	13 regionally rare medium significance plants on LF-4N, 2 medium significance rare plants on PI-1N (one repeat species, Carex scoparia)	M	13 regionally rare medium significance plants on LF-4N, 1 medium significance rare plant on PI-13N (a repeat species Buttonbush)
• Rare animals	L	no rare animals on either site	M	no rare animals on LF-4N, 3 low significance animals on PI-13N
• Natural vegetation displaced	M	c. 67 ha of natural veg. displaced	M	c. 59 ha displaced
• Potential occurrence of significant features	L	low potential at both LF-4N and PI-1N; located in Halton, low potential for finding additional high significance resources	L	low potential at LF-4N;low on 13N, site is farmed

TABLE 16: SITE BIOLOGY - INDICATOR SCALING AND RATIONALE (cont'd)

INDICATOR	SITE LF-3C SCALE	RATIONALE	SITE LF-9C SCALE	RATIONALE	SITE LF-1E SCALE	RATIONALE	SITE LF-1E/PI-27E* SCALE	RATIONALE
• Rare plants	L	one medium signif. species, 3 low signif. species	H	two high signif. species, 4 low signif. species	L	no H,M signif. species, 5 low signif. species	H	Two high, 1 medium, 5 low signif. rare species (2 L signif. species occur on both sites - Pin Oak, Spray Aster)
• Rare animals	L	1 low signif. species (Eastern Bluebird)	H	1 high, 1 medium signif. species, 3 low signif. species	L	one low signif. species (Opossum)	L	one low signif. species (Opossum)
• Natural vegetation displaced	M	c.75 ha of natural vegetation displaced	M	c.61 ha of natural veg. displaced	L	c.55 ha of nat. veg. displaced	H	c. 83 ha of nat. veg. displaced
• Potential for occurrence of significant features	M	moderate to high probability of finding more rare species; rare species occur in the site vicinity and habitat is varied on site	L	site well studied already, probability of finding additional significant occurrences is low	H	high probability of finding more rare species, considerable area of nat. veg. on site, high probability of finding more rare species in Niagara	H	high potential on two sites to find more rare species, considerable area of nat.veg. on site, high probability of finding more rare species in Niagara

* Note: PI-27E site area considered to be south of railway alignment only.

A sensitivity analysis was performed to compare the siting option scale values with and without recently disturbed field included in the area of natural vegetation total. Table 17 contains the scaling results.

For three of six siting options the scale values remain the same. For the other three options the scale value increased or decreased one level.

TABLE 17: SCALING AREA OF NATURAL VEGETATION, WITH AND WITHOUT RECENTLY DISTURBED FIELD COVER TYPE

Siting Option	Recently Disturbed Field			
	With		Without	
	Area of Nat. Vegetation (ha)	Scale Level	Area of Nat. Vegetation (ha)	Scale Level*
LF-4N/ PI-1N	67	M	36	L
LF-4N/ PI-13N	59	L	30	L
LF-3C	75	M	62	H
LF-9C	61	L	23	L
LF-1E	55	L	45	M
LF-1E/ PI-27E	83	H	67	H

*Note: These scale levels were carried forward for use in the comparative evaluation.

Scale values without recently disturbed field were carried forward into the comparative evaluation of siting options. Reasons for using these values are as follows:

- natural vegetation on recently disturbed field may be ploughed under in future years;
- the wildlife habitat value of this cover type may be limited;
- all sites have old field area represented as part of the site vegetation complex; this cover type may be of greater habitat value than recently disturbed field;
- this approach increases the relative weight placed on areas of forest and shrub cover type; this is appropriate since these cover types take longer to become established and hence may be considered to be of greater significance;
- recently disturbed field contributed a major proportion of the natural vegetation on some sites, but the biological value of this cover type is usually low;
- scaling without recently disturbed field yields results which are consistent with professional judgement on the relative significance of natural vegetation associated with specific siting options.

3.2.4 INDICATOR AGGREGATION

Only one factor has more than one indicator: rare plant and rare animal species are indicators which contribute to the rare species factor.

The range of combinations of rare plant and animal scaling values are contained in Table 18. There are six value combinations. Aggregation of indicators results in amalgamation of rare species data so a single factor suitability level can be assigned.

A three level factor suitability rating system was used. The relative suitability levels are -1 (low impact), -3 (medium impact) and -5 (high relative impact).

In assigning rare plant and animal species combinations to suitability rating categories, (Table 18), it was assumed that rare plant scale levels were of most importance. This is the case since the real potential for impact on rare plants is very definite. Plants are not mobile and are susceptible to changes in soil moisture regimes created by drainage works.

Rare animal species are primarily birds and mammals which are mobile and can move to suitable areas not affected by the proposed development. For this reason rare animals were a secondary consideration in assigning rare species suitability ratings.

TABLE 18: AGGREGATION OF RARE PLANT/ANIMAL INDICATORS - SITE

Siting Option	Scale Values		Factor Suitability Level (F.S.L.)	Rationale for F.S.L.
	Plant	Animal		
LF-3C	L	L	-1	low potential impact on both rare plant and rare animal species
LF-1E	L	L	-1	
LF-4N/ PI-1N	M	L	-3	medium potential impact on rare plant species warrants assigning -3 F.S.L.
LF-4N/ PI-13N	M	M	-3	medium potential impact on rare plant and animal species
LF-1E/ PI-27E	H	L	-5	high potential impact on rare plant species warrants assigning -5 F.S.L.
LF-9C	H	H	-5	high potential impact on rare plant and animal species

3.2.5 RANKING BASED ON SITE BIOLOGY FACTORS

Table 19 contains factor suitability levels for the eight siting options. Relative weights must be given to the three factors before the siting options can be ranked.

TABLE 19: SITE BIOLOGY - FACTOR SUITABILITY LEVELS BY SITING OPTION

Siting Option	Rare Species	Pot. Occurrence of Significant Biological Features	Area of Natural Vegetation Displaced*
LF-4N/ PI-13N	-3	-1	-1
LF-4N/ PI-1N	-3	-1	-1
LF-3C	-1	-3	-5
LF-9C	-5	-1	-1
LF-1E	-1	-5	-3
LF-1E/ PI-27E	-5	-5	-5

*Note: F.S.L. without recently disturbed field.

Biology factors were assigned a relative rank on a scale ranging from 1 to 5. One was the lowest rank level and 5 was assigned to the most important factors. The report entitled "Site Selection Process Phase 4A: Selection of a Preferred Site(s) - Site Selection" (Dillon, 1985a) contains an extensive discussion of factor ranking.

Table 20 contains a rationale discussion which outlines the ranks assigned to each of the three site biology factors. Area of natural vegetation displaced received the lowest rank, potential for encountering significant features during detailed field studies received an intermediate rank and rare species received the highest rank.

Ranking of sites was based on a review of the factor suitability levels contained in Table 19 and application of the ranks assigned to factors, as outlined in Table 20. The assessment was not a mathematical calculation; rather, it was a visual inspection of the factor suitability levels tempered by professional judgement.

TABLE 20: RATIONALE FOR ASSIGNMENT OF SITE FACTOR RANK

RARE SPECIES

- presently known to occur on several sites
- some locations of distribution on site and approximate size of populations are known
- on other sites we suspect that more stations exist for known species and other rare species may exist on site -- hence the need for the "Potential for occurrence of Significant Features" factor
- when known, rare species should be a significant factor since potential impacts on rare species would be of concern to agencies and the public
- if displaced, potentially represents loss of significant features
- the distinction between rare and "endangered" species was deemed significant by public workshop attendees
- no species cited in the Endangered Species Act have been confirmed on any OWMC candidate sites
- assigned a 4 rank, highest rank assigned to a biology factor

TABLE 20 (cont'd)

POTENTIAL FOR OCCURRENCE OF SIGNIFICANT FEATURES

- the existing level of field work has been adequate for determining the relative level of constraint posed by biological resources on candidate sites; however, certain sites have potential for supporting rare species and significant habitat -- the reality of this potential will not be known precisely until detailed year-round field studies have been completed in Phase 4B
- the potential for finding other occurrences which could represent important impact situations should be considered during the Phase 4A comparative evaluation
- it is not possible to predict whether potential significant occurrences will represent major impacts or whether these impacts could be mitigated
- a significant factor but must be ranked lower than rare species occurrences which are presently known
- assigned a 3 rank, second highest rank assigned to a biology factor

NATURAL VEGETATION DISPLACED

- the areal extent of natural vegetation lost provides a general indication of wildlife habitat loss
- amount of natural vegetation on a site is indicative of the biological significance of a site, e.g. if site is intensively farmed and has only a few hectares of natural vegetation, its value to wildlife is probably low and the probability of rare species occurrence is low
- simple occurrence of small areas of common types of natural vegetation is not considered to be of biological significance. No sites have extensive blocks of forest or other habitat types which are required by species having large territories
- if rare species are known to use the natural vegetation on site, or if the habitat is considered to hold potential for containing significant features, this is dealt with in other factors
- generally no agency policy regarding this factor
- this factor receives the lowest rank of the three site factors, 2

Ranking of siting options from a biological perspective from most preferred to least preferred is as follows:

- LF-4N/PI-1N
- LF-4N/PI-13N
- LF-9C
- LF-3C
- LF-1E
- LF-1E/PI-27E

The northern siting options are preferred to those in the Niagara Peninsula. Although the northern options have potential for moderate impact on rare species, factor suitability levels (F.S.L.) for areas of natural vegetation displaced and potential for occurrence of other significant features are low. Factor suitability levels for the two northern options are the same but the LF-4N/PI-1N combination is considered to be slightly preferred to the LF-4N/PI-13N combination because three rare animal species have been reported from PI-13N, while none have been reported from PI-1N. Although this is not directly reflected in site factors, the proximity of the Sixteen Mile Creek Valley to PI-13N is a consideration in evaluating the potential significance of candidate site PI-13N.

Integrated siting options LF-3C, LF-9C and LF-1E have combinations of factor suitability levels which are similar. Although LF-9C received a high factor suitability rating for rare species, it is predicted that there is potential for finding other significant biological features including rare species, on LF-3C and LF-1E.

LF-1E was ranked least preferred of the three integrated options because of the high potential for finding other significant biological features. LF-9C was ranked similar to, but slightly preferred to LF-3C. LF-3C has the second highest area of natural vegetation displaced and this is a definite impact. Except for rare species, factor suitability levels associated with LF-9C are lower than those of LF-3C. The extent of dependence of the rare animal species on LF-9C remains to be confirmed so the consideration given the rare species F.S.L. in this comparison has been tempered.

The LF-1E/PI-27E siting option has the highest F.S.L.s of any option. This option was the least preferred when comparing the site study areas.

3.3 SITE VICINITY IMPACT PREDICTION

3.3.1 INTRODUCTION

A radius of approximately 2 km from the center of sites was chosen as the site vicinity study area. In this area less direct, off-site impacts of various types and degrees would be expected.

During construction and facility operation, noise, fugitive emissions, sedimentation and changes in drainage patterns and soil moisture regimes might occur off-site. These types of impacts likely would be manifested most obviously around the site margin.

Four factors supported by five indicators, (see Appendix A, "factor sheets") were identified to address the site

vicinity study area. Factors and indicators listed in Table 21 were identified early in Phase 4A to focus data collection and analysis. In the present chapter we discuss procedures for determining which indicators and factors should be "applied" in siting option ranking.

TABLE 21: FACTORS AND INDICATORS USED DURING DATA COLLECTION - SITE VICINITY

FACTORS	INDICATORS
Rare Species	• Number of rare species
Significant Environmental Units	• Distance(s) from SEU(s) to site(s)
Other Natural Vegetation	• Areal extent of natural vegetation
Fish and Wildlife Features of Signficance	• Number and significance of special habitats
	• Distance from site to significant fish and wildlife features

Site vicinity indicators were screened, scaled and aggregated. Definitions of these terms are contained in Section 3.1.

3.3.2 INDICATOR SCREENING

Draft site vicinity data matrices contained in the technical appendices (site reports) were examined to determine which indicators should be screened out. A network diagram (Figure 8) was prepared which illustrated interrelationships among indicators. Unlike the situation with site indicators, there was little overlap among site vicinity indicators.

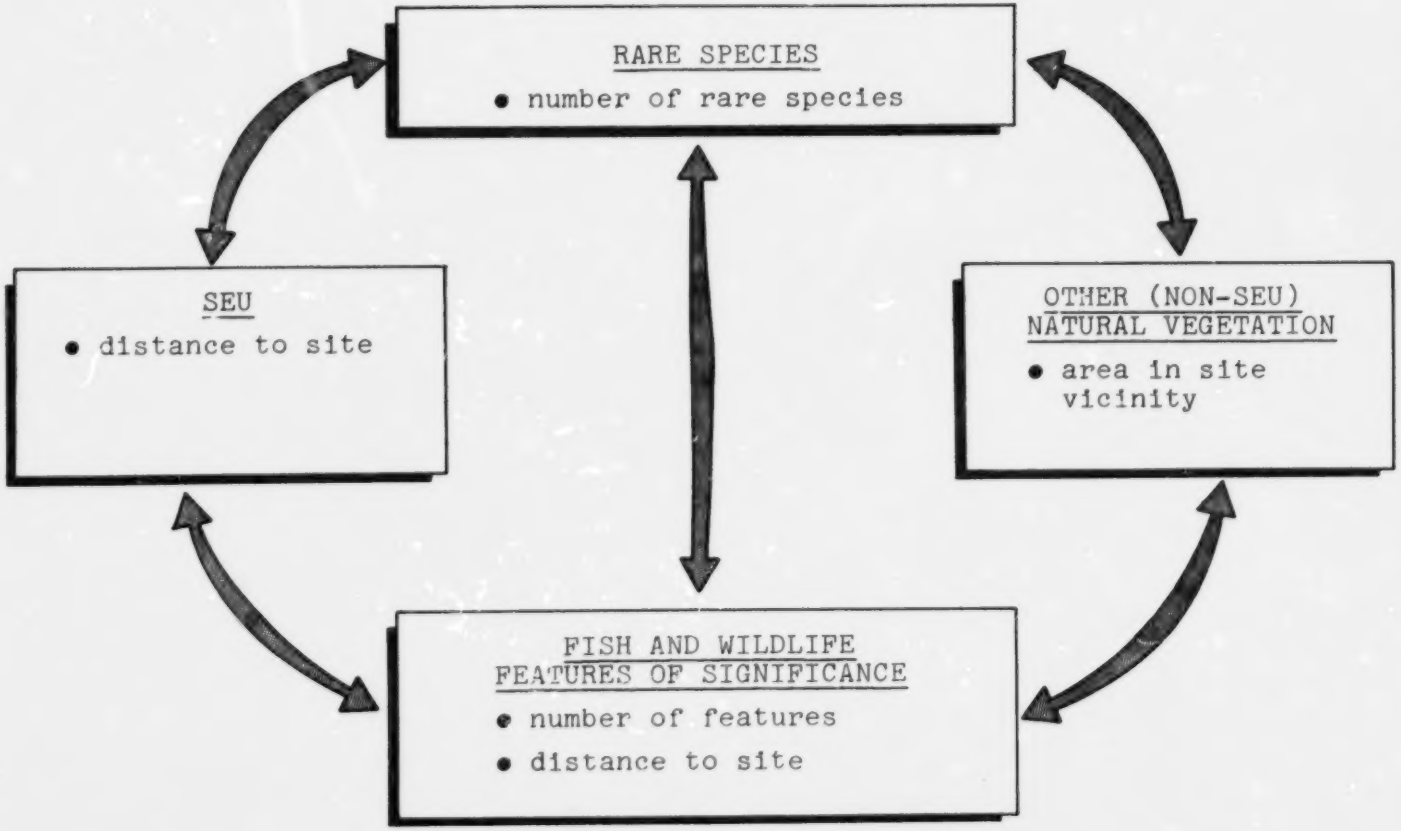

FIGURE 8 - Interrelationships - Site Vicinity Factors and Indicators

The screening activity was designed to assess whether indicators chosen for data collection purposes were suitable for use in option comparison.

Following an assessment of factors and indicators it was concluded that distances between the site and features will not be used to develop impact predictions during Phase 4A. Rather, more general indicators such as the number of features and the areal extent of certain indictors occurring within a study zone will be used in option comparison.

Types of impacts affecting rare plants may be different from those affecting rare animals. Separate indicators were developed to record the number of rare plants and rare animals.

Table 22 contains the list of indictors which were used to synthesize site vicinity data for siting option comparisons.

TABLE 22: FACTORS AND INDICATORS USED IN SITE VICINITY COMPARISONS

FACTORS	INDICATORS
Rare Species	• Number of rare plant species
	• Number of rare animal species
Significant Environmental Units	• Areal extent of SEUs
Other Natural Vegetation	• Areal extent within site vicinity
Fish and Wildlife Features of Significance	• Number of significant features

3.3.3 INDICATOR SCALING

As described in Section 3.1, scaling is the procedure of converting numerical data on indicator occurrences into units of desirability from a potential impact perspective.

A three level scaling system was used, as follows:

- high - major potential impact
- medium - moderate potential impact
- low - minor or positive impact

Scaling levels are relative impact levels across the values observed. These levels do not represent absolute

impact levels in the context of all possible impacts; rather, they are predicted impact levels only for the candidate sites and proposed facilities. This allows a comparative evaluation of siting options.

Several activities were involved in transforming technical appendix data for each site into indicator data for siting options. Issues that were addressed included:

- combining data from two sites for partially integrated options;
- overlapping site vicinities;
- site vicinities overlapping with sites;
- effects of boundary refinement at Sites LF-3C, LF-1E, PI-1N -- areas which were dropped from the site study area became part of the site vicinity.

3.3.3.1 Overlapping study zones

For PI-1N, LF-4N and PI-27E, LF-1E the site vicinities overlap and site vicinities of one site include portions of the study area of the other site in the pair.

Since it is assumed that all factor features on sites will be displaced there is no need to consider additional potential impacts associated with the overlapping site vicinity.

In the zone where two site vicinities overlap, the following assessment approach was used:

- in "normal" site vicinities it is assumed that all features within the study zone could potentially be affected because of as yet undefined site vicinity impacts,

- in the overlap situation, two siting options influence the overlap area,

- the first of the two vicinity zones is assumed to affect resources in the overlap area, and the second site vicinity is assumed to create no further impact.

Table 23 contains indicator data for boundaries following boundary refinement. For partially integrated options, data for both options are combined. Data are from summary matrices in the technical appendices for each site.

3.3.3.2 Rare species

The number of rare plant and animal species present in each site vicinity are indicators. We have examined the range of rare species reported and concluded that various levels of significance can be applied to the occurrence of these species. An assessment and rationale for placing rare species in a high, medium or low significance category is contained in working tables in GLAL files.

Table 24 indicates results of this assessment and summarizes the number of plant and animal species in each category, for each siting option.

TABLE 23: BIOLOGY INDICATOR DATA FOR SITING OPTIONS - SITE VICINITIES

INDICATOR	SITING OPTIONS			
	LF-2N/PI-1N	LF-2N/PI-13N	LF-4N/PI-1N	LF-4N/PI-13N
• Areal extent of SEUs	approximately 125 ha	approximately 79 ha	approximately 140 ha	approximately 94 ha
• Areal extent of other natural vegetation	approximately 172 ha	approximately 216 ha	approximately 245 ha	approximately 291 ha
• Number of significant fish and wildlife features	1 feature, waterfowl staging area	none	1 feature, waterfowl staging area	1 feature, waterfowl staging area
• Number of rare plant species	8 rare species	7 rare species	8 rare species	7 rare species
• Number of rare animal species	3 rare species	7 rare species	3 rare species	6 rare species
INDICATOR	LF-3C	LF-9C	LF-1E	LF-1E/PI-27E
• Areal extent of SEUs	approximately 100 ha	approximately 145 ha	approximately 393 ha	approximately 636 ha
• Areal extent of other natural vegetation	approximately 298 ha	approximately 111 ha	approximately 370 ha	approximately 692 ha
• Number of significant fish and wildlife features	4 features; 3 pike spawning areas, 1 waterfowl production area	2 features; pike spawning areas	2 features; pike spawning areas	4 features; 3 pike spawning, 1 waterfowl production area
• Number of rare plant species	17 rare species	1 rare species	5 rare species	5 rare species
• Number of rare animal species	3 rare species	3 rare species	7 rare species	10 rare species

TABLE 24: RARE SPECIES - SITE VICINITY *

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-2N/PI-1N	Carex scoparia	M	
	Twin-leaf	M	
	Chinquapin Oak	M	
	Virginia Cowslip	M	Plants:
	Meadow Horsetail	M	0 High
	New York Fern	M	10 Medium
	Baltic Rush	M	0 Low
	Butterfly-weed	M	
	Black Oak	M	
	Black Snakeroot	M	
	Redside Dace	M	Animals:
	Red-shouldered Hawk	L	0 High
	Eastern Bluebird	L	1 Medium
			2 Low
LF-2N/PI-13N	Bluebells	M	
	Twin-leaf	M	Plants:
	Poke Milkweed	M	1 High
	Chinquapin Oak	M	6 Medium
	Burning Bush	H	0 Low
	Harbinger of Spring	M	
	False Foxglove	M	
	Redside Dace	M	Animals:
	Red-shouldered Hawk	L	0 High
	Whip-poor-will	L	2 Medium
	Eastern Bluebird	L	5 Low
	Bobcat	L	
	Eastern Hognose Snake	M	
	West Virginia White Butterfly	L	

Note: H = High, M = Medium, and L = Low significance

* Rare species significance levels are provided for species present within the Phase 3B acquisition boundaries.

TABLE 24: RARE SPECIES - SITE VICINITY

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-4N/PI-1N	Carex amphibola	M	
	Twin-leaf	M	
	Chinquapin Oak	M	
	Virginia Cowslip	M	
	Meadow Horsetail	M	Plants:
	New York Fern	M	0 High
	Baltic Rush	M	12 Medium
	Butterfly-weed	M	0 Low
	Black Oak	M	
	Carex grayi	M	
	Carex scoparia	M	
	Black Snakeroot	M	
	Red-shouldered Hawk (probably from 4N or 1N)	L	Animals: 0 High
	Eastern Bluebird (both)	L	0 Medium 3 Low
	West Virginia White Butterfly	L	
LF-4N/PI-13N	Bluebells	M	
	Twin-leaf	M	Plants:
	Poke Milkweed	M	1 High
	Chinquapin Oak	M	6 Medium
	Burning Bush	H	0 Low
	Harbinger of Spring	M	
	False Foxglove	M	
	Red-shouldered Hawk (probably from 4N or 13N)	L	
	Whip-poor-will	L	Animals:
	Eastern Bluebird (both)	L	0 High 1 Medium
	Bobcat	L	5 Low
	Eastern Hognose Snake	M	
	West Virginia White Butterfly (both)	L	

TABLE 24: RARE SPECIES - SITE VICINITY

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-3C	Tupelo	L	
	Tulip Tree	L	
	Red Pine	L	
Note: heavy sampling effort has occurred in this site vicinity	Southern Arrow-wood	L	Plants:
	Hazelnut	M	1 High
	Pondweed		10 Medium
	P. foliosus	M	6 Low
	Sedge		
	Carex alopecoidea	M	
	C. grayi	M	
	Narrow-panicled Rush	H	
	Water Dock	M	
	Green Water-milfoil	M	
	Hedge Nettle	M	
	Spray Aster	L	
	Wild Yam	M	
	Little Blue-eyed Grass	M	
	Short-styled Snakeroot	M	
	Pin Oak	L	
	Whip-poor-will	L	Animals:
	Opossum	L	0 High
	Eastern Bluebird	L	0 Medium
			3 Low
LF-9C	Tupelo	L	Plants:
			1 Low
	Opossum	L	Animals:
	Lynx	M	1 High
	Black Rat Snake	H	1 Medium
			1 Low

TABLE 24: RARE SPECIES - SITE VICINITY

SITING OPTION	SPECIES	SIGNIFICANCE LEVEL	OPTION SUMMARY
LF-1E	Pignut Hickory	L	Plants:
	Pin Oak	L	0 High
	Spray Aster	L	0 Medium
	Tupelo	L	5 Low
	Southern Arrow-wood	L	
	Red-shouldered Hawk	L	Animals:
	Northern Bobwhite	L	1 High
	Tufted Titmouse	M	2 Medium
	Opossum	L	4 Low
	Grey Fox	M	
	Blanding's Turtle	L	
	American Badger	H	
LF-1E/PI-27E	Pignut Hickory	L	Plants:
	Pin Oak (both site vic. where overlaps onto sites)	L	0 High 0 Medium 5 Low
	Spray Aster (site vic. of 1E overlap with site 27E)	L	
	Tupelo	L	
	Southern Arrow-wood (in both site vicinities)	L	
	Red-shouldered Hawk	L	Animals:
	Northern Bobwhite (both site vic.)	L	2 High 3 Medium
	Tufted Titmouse	M	5 Low
	Opossum (both site vic.)	L	
	Grey Fox	M	
	Blanding's Turtle	L	
	American Badger	H	
	Acadian Flycatcher	H	
	Eastern Bluebird	L	
	Yelow-breasted Chat	M	

3.3.3.3 Scaling results

The basic acceptability screen which led to the rejection of LF-2N was completed prior to scaling. The site vicinity data which were scaled were for areas as they existed following boundary refinement and included the lands north of the rail alignment through PI-27E. Table 25 provides a rationale for the scaling of plant and animal species and other indictors into high, medium and low scale levels.

Results of applying the indicator scaling system outlined in Table 25 are contained in Table 26. Table 26 records the indicator scaling level assigned and a rationale for assigning these levels for specific options. Tables 25 and 26, and subsequent tables address the six options which remained following rejection of LF-2N.

3.3.4 INDICATOR AGGREGATION

Only one factor (rare species) has more than one indictor:

- number of rare plant species
- number of rare animal species

The range of combinations of rare plant and animal scaling values are contained in Table 27.

Aggregation of indicators results in amalgamation of rare species data so a single factor suitability level can be assigned.

TABLE 25: INDICATOR SCALING SYSTEM FOR SITE VICINITY

INDICATOR	SITING OPTION DATA RANGES	SCALE LEVEL	RATIONALE
Number of high, medium, and low significance rare plant species	1, 10, 6 * 1, 6, 0	High	• high significance rare plant species occur • high constraint in relative terms
	0, 8, 0	Medium	• several medium significance rare plant species • medium constraint in relative terms
	0, 0, 5 0, 0, 1	Low	• low significance plant species only • 5 or fewer • low constraint in relative terms
Number of high, medium, and low significance rare animal species	2, 3, 5 1, 2, 4	High	• one or more high significance species combined with two or more medium significance species • high constraint in relative terms
	1, 1, 1	Medium	• only one high significance species and only one medium • medium constraint in relative terms
	0, 1, 5 0, 0, 3	Low	• no high significance species, maximum of one medium significance species • low constraint in relative terms
Areal extent of SEUs (ha)	636	High	• greatest area • value considerably larger than others • high constraint in relative terms
	393	Medium	• mid range of data values • medium constraint in relative terms

Table 25: (continued)

INDICATOR	SITING OPTION DATA RANGES	SCALE LEVEL	RATIONALE
Areal extent of SEUs (ha)	145 140 100 94	Low	• lowest values in data range • values are similar • low constraint in relative terms
Areal extent of other natural vegetation (ha)	692	High	• greatest area • value considerably larger than others • high constraint in relative terms
	370 298 291	Medium	• mid range of data values • medium constraint in relative terms
	245 111	Low	• lowest values in data set • low constraint in relative terms
Number of fish and wildlife features of significance	4	High	• largest value in data set • high constraint in relative terms
	2	Medium	• mid value in data set • medium constraint in relative terms
	1	Low	• smallest value in data set • medium constraint in relative terms

* 1, 10, 6 means 1 high, 10 medium, 6 low significance rare plant species

Note: Assume that for purposes of the relative comparison, all indicator features within the site vicinity are potentially impacted by facility development.

TABLE 26: SITE VICINITY BIOLOGY - INDICATOR SCALING AND RATIONALE

INDICATOR	LF-4N/PI-1N Scale	LF-4N/PI-1N RATIONALE	LF-4N/PI-13N Scale	LF-4N/PI-13N RATIONALE
Areal extent of SEUs	L	c. 140 ha	L	c. 94 ha, second lowest area of all siting options
Areal extent of other natural vegetation	L	c. 245 ha, fourth lowest area of all siting options	L	c. 291 ha, at highest limit of low scale
Number of significant F. & W. features	L	one feature (waterfowl staging area)	L	1 feature (waterfowl staging area)
Number of rare plant species	M	8 med. significance rare species	H	1 high, 6 med. significance rare species
Number of rare animal species	L	3 low significance species	L	1 med., 5 low significance species

TABLE 26 :(cont'd) SITE VICINITY BIOLOGY - INDICATOR SCALING AND RATIONALE

INDICATOR	LF-3C Scale	LF-3C RATIONALE	LF-9C Scale	LF-9C RATIONALE	LF-1E Scale	LF-1E RATIONALE	LF-1E/PI-27E Scale	LF-1E/PI-27E RATIONALE
Areal extent of SEUs	L	c. 100 ha	L	C. 145 ha	M	c. 393 ha, second largest area	H	c.636 ha, largest area of siting options
Areal extent of other natural vegetation	L	c. 298 ha	L	c. 111 ha, lowest area of all siting options	M	c. 370 ha, second largest area	H	c.692 ha, largest area of siting options
Number of significant F. & W features	H	4 features (3 pike spawning areas, 1 waterfowl production area)	M	2 features (pike spawning areas)	M	2 features (pike spawning areas)	H	4 features (3 pike spawning areas, 1 waterfowl production area)
Number of rare plant species	H	1 high, 10 med., 6 low significance species	L	1 low significance species	L	5 low significance species	L	5 low significance species
Number of rare animal species	L	3 low significance species	M	1 high, 1 med., 1 low significance species	H	1 high, 2 med., 4 low significance species	H	2 high, 3 med., 5 low significance species

* Note: PI-27E site area considered to be south of railway alignment only.

TABLE 27: AGGREGATION OF RARE PLANT/ANIMAL INDICATORS - SITE VICINITY

Siting Options	Scale Values		Factor Suitability Level (F.S.L.)	Rationale for F.S.L.
	Plant	Animal		
LF-9C	L	M	-1	low potential impact on rare plant species, medium potential impact on rare animals, not enough to raise F.S.L. above -1
LF-1E	L	H	-3	low potential impact on rare plant species, high potential impact on rare animals raises F.S.L. to -3
LF-1E/ PI-27E	L	H	-3	
LF-4N/ PI-1N	M	L	-3	medium potential impact on rare plant species justifies assigning -3 F.S.L.
LF-3C	H	L	-5	high potential impact on rare plant species warrants assigning -5 F.S.L.
LF-4N/ PI-13N	H	L	-5	

Site vicinity factor suitability levels were assigned from a three level scale of -1, -3 and -5. These represent relative potential impact levels: -1 (low potential impact), -3 (medium potential impact), -5 (high potential impact).

In assigning rare plant and animal species combinations to suitability rating categories, it was assumed that rare plant scale levels were of most importance. This is the case since the real potential for impact on rare plants is very definite. Plants are not mobile and are susceptible to changes in soil moisture regimes created for example, by drainage works.

The rare animal species are primarily birds and mammals which are mobile and can move to suitable areas not affected by the proposed development. For this reason, rare animals were a secondary consideration in assigning rare species suitability ratings.

3.3.5 RANKING BASED ON SITE VICINITY BIOLOGY FACTORS

After the two rare species indicators were aggregated each site vicinity factor was represented by a single indicator. At this point, siting option ranking can be completed on the basis of suitability levels.

Table 28 contains ratings by factor for the six siting options. Low, medium and high scaling values have been transformed into factor suitability levels of -1, -3 and -5, respectively. Ratings for aggregated rare species data were obtained from Table 27.

The relative weights assigned to the four site vicinity factors were assigned before siting option rankings were determined. Table 29 presents a rationale for the weights assigned to the site vicinity biology factors.

TABLE 28: SITE VICINITY BIOLOGY - FACTOR SUITABILITY LEVELS BY SITING OPTION

Siting Option	FACTORS			
	SEUs	Other Natural Vegetation	Significant F. & W. Features	Rare Species
LF-4N/ PI-1N	-1	-1	-1	-3
LF-4N/ PI-13N	-1	-3	-1	-5
LF-3C	-1	-3	-5	-5
LF-9C	-1	-1	-3	-1
LF-1E	-3	-3	-3	-3
LF-1E/ PI-27E	-5	-5	-5	-3

TABLE 29: RATIONALE FOR ASSIGNING SITE VICINITY FACTOR RANK

SIGNIFICANT ENVIRONMENTAL UNITS

- published reports document these features
- similar studies to identify these features have been conducted in regions where all sites occur; thus, this factor provides a good basis for comparison among sites
- these represent a broad range of known significant biological features and in many instances represent areas having a high potential for containing other significant undocumented features
- many SEUs provide habitat for rare species and fish and wildlife habitat of regional significance
- recognized as the more significant biological areas in the view of agencies and special interest groups
- known to contain significant features - sensitivity of features to impact is not presently known
- a relatively high significance site vicinity factor, assigned 2 rank

OTHER NATURAL VEGETATION

- biological significance unknown but suspected to be high - supported by classic habitat interpretation methods
- may represent significant features susceptible to impact
- sensitivity of these features is presently unknown
- potential for providing rare species and significant fish and wildlife habitat
- aerial photos allow a level of confirmation
- a relatively high significance site vicinity factor, assigned 2 rank

TABLE 29: (cont'd)

SIGNIFICANT FISH AND WILDLIFE FEATURES

- data generally unpublished agency comments and public input
- generally features of local significance which might occur throughout extensive portions of a region
- does not involve rare species
- exclusive of SEUs, areas not deemed significant enough to be designated as SEUs
- our knowledge of these features is dependent on input of others, reports were not field checked
- a relatively low significance site vicinity weight, assigned 1 rank

RARE SPECIES

- significant occurrences, but most are already accounted for in SEUs
- many are historic records, present day status is unknown, generally no confirming field work by GLAL
- data base is skewed by level of field work by others, e.g. special studies in LF-3C yields a vicinity with a -5 suitability rating; similar work in the vicinity of LF-9C, which presently has a -1 rare species rating, might yield results similar to those of LF-3C
- rare species are significant features, but their sensitivity is presently unknown
- probability of impact is likely low
- a relatively low significance site vicinity weight, assigned 1 rank

****

Factors and their rank are as follows:

- SEUs: 2
- Other natural vegetation: 2
- Significant fish and wildlife features: 1
- Rare species: 1

Given these factor rankings, siting options listed in order from most to least preferred are as follows:

- LF-4N/PI-1N } similar
- LF-9C }

- LF-4N/PI-13N

- LF-3C } similar
- LF-1E }

- LF-1E/PI-27E

The LF-1E/PI-27E siting option is definitely least preferred from a biological perspective. For site vicinity factors, differences among the two northern and the LF-9C siting options, are not great.

It is difficult to determine major distinctions between the four north and central options. The northern options involve partially integrated facilities and the areal extent of SEUs and other natural vegetation in the two site vicinity zones is similar to that of the two central options.

Relative differences exist between the least preferred siting option and other options, but all options are acceptable.

Site vicinity impacts must be considered in conjunction with results of the site and access road study results. This assessment is contained in Chapter 4.

3.4 FACTOR SUITABILITY LEVELS OF PREFERRED ACCESS ROAD OPTIONS

3.4.1 FACTOR SUITABILITY LEVELS

As a result of the Step 2 access route analysis, a preferred route for each siting option was identified by the site selection team. A comparison of six of the eight preferred access route options was subsequently carried out, the results of which appear in Table 30. Preferred options to PI-1N/LF-2N and PI-13N/LF-2N were not assessed at this stage since LF-2N had been eliminated from consideration as a Candidate Site.

3.4.1.1 Analytical approach

Factor suitability levels are relative impact levels which are expressed numerically. These were determined for the preferred access routes and were used to express road-associated constraints when combined with other study areas to facilitate the overall comparison of facility siting options.

The analytical approach and data base used to determine suitability levels were very similar to those used in Step 2. Lengths of regionally and locally significant fisheries

and the spill pathway index were used as indicators of the Transportation Impact on Fish Communities factor.

Fishery constraint scaling was applied to both significant fisheries indicators for each of the six options. Scaling was across the range of fishery length values associated with preferred routes. Indicator aggregation, a method of combining indicator scale levels to obtain a single factor value, yielded a level of constraint associated with specific options. Constraint levels were then converted into factor suitability levels, indicating the relative level of impact associated with each option.

3.4.1.2 Assignment of factor suitability levels

Factor suitability levels were determined from a range of -1 to -5. The -1 level represents an unconstrained situation, (e.g. zero significant fishery stream length for an indicator), level -3 is a medium constraint situation in a relative sense, and level -5 on the relative scale, represents the highest potential impact level.

Table 30 contains constraint values for the six preferred routes. For the LF-1E and LF-1E/PI-27E options there is no significant downstream fishery. In those situations the constraint scale level was "low" and two low values were equated with a -1 factor suitability level. A rationale for the factor suitability levels assigned to other aggregated fishery scale levels is provided in Table 31.

3.4.1.3 Comparison of preferred access road options

The spill pathway index is an indicator of the Transportation Impact on Fish Communities factor. It provides an indication

of the potential of spilled wastes entering a watercourse. It combines a spill index, along an access route with the proportion of the access route where spilled wastes are likely to enter watercourses, the number of vehicle accidents, and the number of vehicles anticipated on a road section. The derivation of the spill index is explained in "Site Selection Phase 4A: Selection of a Preferred Site(s) - Transportation" (Dillon, 1985b).

The proportion of the access route where spilled wastes are likely to enter a watercourse consists of the ratio of stream crossing distance to access route length, for each link of the route.

The spill pathway index was determined by multiplying the ratio of stream crossing distance to access route link length by the spill index, summed over the entire route length.

Data on regionally, locally significant fisheries and spill pathway index are summarized in Table 30.

Significant fisheries data were relied on most heavily when comparing preferred access road options. Primary consideration was given to regionally significant fisheries, and secondary consideration was given to locally significant fisheries. The spill pathway index, which recognizes that the potential of a spill occurring is also a consideration, was relied upon as a decision-making tool only in cases where no clear cut distinctions could be drawn among options.

Table 30:
COMPARISON OF PREFERRED ACCESS ROAD OPTIONS

SITE	PREFERRED ACCESS ROUTE OPTION	LENGTH OF REGIONALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR REGIONALLY SIGNIFICANT FISHERY	LENGTH OF LOCALLY SIGNIFICANT FISHERY (KM)	FISHERY CONSTRAINT SCALING FOR LOCALLY SIGNIFICANT FISHERY	FACTOR SUITABILITY LEVEL	SPILL PATHWAY INDEX
LF-9C	From QEW - south on Vineland Townline Road (Regional Road 24); west on Hwy. 20 to LF-9C	109.1	Medium	27.2	Low	-3	1.521
LF-3C	From QEW - south on Vineland Townline Road (Regional Road 24); west on Hwy. 20; west on Regional Road 65 from Bismarck; south on Krick Road to LF-3C	109.1	Medium	373.9	High	-3	1.209
LF-1E	From QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road); south on Crowland Avenue; west on Carl Road to LF-1E	0	Low	0	Low	-1	0
PI-27E/ LF-1E	From QEW - west on Regional Road 47 (Lyons Creek Road/Biggar Road) to PI-27E	0	Low	0	Low	-1	0
PI-1N/ LF-4N	From 401 - south on Fourth Line; west on Britannia Road to PI-1N	145.6	High	179.5	Medium	-5	0.721
PI-13N/ LF-4N	From 401 - south on Fourth Line; east on Britannia Road; south on Fifth Line Road to PI-13N	145.6	High	189.5	Medium	-5	0.579

TABLE 31: RATIONALE FOR ASSIGNING FACTOR SUITABILITY LEVELS ON THE BASIS OF FISHERY CONSTRAINT LEVELS

Constraint Levels for Significant Fisheries Indicators		Factor Suitability Level (F.S.L.)	Rationale
Regional	Local		
L	L	-1	• both indicators had zero length of significant fishery
M	L	-3	• a MEDIUM constraint for regionally significant fisheries warrants a -3 F.S.L. even though the constraint for locally significant fisheries is LOW
M	H	-3	• a MEDIUM constraint for regionally significant fisheries is given additional weight in combination with a HIGH constraint for locally significant fisheries
H	M	-5	• assigned an overall constraint of -5 because of HIGH level for regionally significant fisheries

3.4.2 FACTOR RANK

The transportation impact on fish communities factor is one of several impact factors used to compare Phase 4A Step 2 road access options. It was necessary to determine what rank or weight should be applied to this factor so that its relative importance in decision-making would be evident to the site selection team.

Rank was chosen from a range of values from 1 to 5, where level 1 includes factors considered least significant for comparing options. The following issues were considered when determining an appropriate factor rank: potential for impact, severity of impact, public policy, significance of the feature or resource, frequency/duration of impact, connections to other factors, uncertainty and potential for mitigation. Fish communities were given a level 2 rank. Reasons for this choice include the following:

- the real potential for impact, severity, frequency and duration of impact are all relatively low because the potential of a spill occurring which would create a major fish kill in a stream containing a significant fish community is relatively low;

- the duration of impact (e.g. fish kill) would be short in the sense that it could be overcome by restocking or natural recolonization provided that habitat is not destroyed;

- certain mitigative measures might be applied to reduce the potential of a spill entering streams; and

- public policy exists regarding this factor, in that contaminant impacts on aquatic life are prohibited by legislation.

4.0 COMPARISON OF FACILITY SITING OPTIONS

4.1 INTRODUCTION

This chapter presents a consolidated comparison of siting options from a biological perspective.

A sensitivity evaluation in the event of changes in site boundaries is reported in this chapter. Shifts in site boundaries would affect both the site and site vicinity study areas, and potentially the siting option rank. Provision of rail access and effluent treatment by evaporation are also considered in the sensitivity analysis chapter.

4.2 METHOD OF COMPARISON

Chapters 2 and 3 contain comparisons of facility option components. That is the access route, site and site vicinity study areas have been compared from a biological perspective. The objective of the present chapter is to compare the relative impacts on biological resources associated with the six complete siting options. These siting options include: the preferred access route (as chosen by the site selection team), the site and site vicinity study areas.

Input to this assessment included the following pieces of information:

(1) preferred access route: (a) downstream length of

regionally significant fishery, and (b) downstream length of locally significant fishery; which yields a factor suitability level, scaled on the basis of (a) and (b) values from among the preferred access routes; and (c) "spill pathway index" value;

(2) site: factor suitability levels and factor ranks;

(3) site vicinity: factor suitability levels and factor ranks.

Table 32 contains factor suitability level data for elements of the siting options. The ranking of options was not based on mathematical calculations, rather the factor suitability levels in Table 32 were inspected, with more weight being assigned to higher ranked factors.

4.3 RESULTS OF FACILITY SITING OPTION COMPARISON

Siting options were ranked from most to least preferred in the following three groups:

A.
- LF-4N/PI-1N
- LF-9C
- LF-4N/PI-13N

B.
- LF-3C
- LF-1E

C.
- LF-1E/PI-27E

TABLE 32: SUMMARY OF FACTOR SUITABILITY LEVELS AND FACTOR RANK

FACTORS	FACTOR RANK	SITING OPTIONS AND F. S. L. s					
		LF-4N/PI-1N	LF-4N/PI-13N	LF-3C	LF-9C	LF-1E	LF-1E/PI-27E
SITE							
Rare species	4	-3	-3	-1	-5	-1	-5
Pot. for occurr. other sign. features	3	-1	-1	-3	-1	-5	-5
Area nat. veg. displaced	2	-1	-1	-5	-1	-3	-5
SITE VICINITY							
SEUs	2	-1	-1	-1	-1	-3	-5
Other nat. vegetation	2	-1	-3	-3	-1	-3	-5
Rare species	1	-3	-5	-5	-1	-3	-3
Significant fish and wildlife features	1	-1	-1	-5	-3	-3	-5
ACCESS ROAD							
Pot. impact on fish communities	2	-5	-5	-3	-3	-1	-1

* Factor ranks are the relative levels of significance assigned to factors. Four is the highest rank assigned to a biology factor and 1 is the lowest. There is no absolute numerical relationship among the rank values.

Table 33 indicates siting option rank and provides a summarized rationale for ranking. Further discussion of ranking follows.

Siting options were grouped because it was difficult to distinguish differences in potential impact associated with several siting options. Ranking of options was confounded by differences in siting option preference within the study areas of two options. For example, although the LF-4N/PI-13N site is preferred to that of LF-9C, the LF-9C site vicinity is preferred to that of LF-4N/PI-13N. Differences in potential for impact among Group A and Group C are clear.

Although the options have been ordered within the first two groups, differences among options within the groups are slight. Differences between LF-4N/PI-13N in Group A and members of Group B are slight. LF-1E/PI-27E is definitely the least preferred of all options from a biological perspective.

TABLE 33: RATIONALE FOR SITING OPTION RANKING

Siting Option	Option Rank	Rationale for Ranking
LF-4N/PI-1N	1	• preferred option from site and site vicinity perspective, access road has potential for impact though on balance LF-9C and LF-4N/PI-13N have similar impact potential
LF-9C	1	• higher potential rare species impact on site than LF-4N/PI-1N, otherwise similar site and site vicinity impact potential, access road impacts potentially lower than for LF-4N/PI-1N and LF-4N/PI-13N • little overall difference between this option and LF-4N/PI-1N and LF-4N/PI-13N
LF-4N/PI-13N	1	• site and access road impact potential similar to that associated with LF-4N/PI-1N • higher site vicinity impact potential than for LF-9C, because of other natural vegetation and rare species in vicinity of LF-4N/PI-13N
LF-3C	2	• somewhat higher site and site vicinity potential impacts than for previous three options • much natural vegetation displaced on site and many rare species known from the site vicinity • access road constraint potentially less than for northern options.

TABLE 33: cont'd

SITING OPTIONS	OPTION RANK	RATIONALE FOR RANKING
LF-1E	2	• similar potential impact as for LF-3C • access route impact potential is lower than for preceding options
LF-1E/PI-27E	3	• least preferred site and site vicinity • potential impacts on site vegetation displaced, rare species, and on natural environment, SEUs, and woodlots surrounding LF-1E/PI-27E • low access route potential impact, however

4.4 SENSITIVITY ANALYSES

Three sensitivity analyses were completed to determine potential implications of facility changes on siting option comparison. Additional boundary refinements for sites LF-3C and LF-1E were examined. The influence of providing rail access to candidate sites and implications of partial solidification were reviewed.

4.4.1 ADDITIONAL PARCELS LF-3C AND LF-1E

To ensure adequate landfill life on LF-1E there may be a need to provide additional area beyond the parcel which is located primarily north of Young Road. Because of potential hydrogeologic constraint in the southeast corner of the original (Phase 3B) LF-1E parcel, land in the southwest quadrant of LF-1E was added to provide extra site area. This parcel is shown on a figure in "Site Selection Phase 4A: Selection of a Preferred Site(s) - Site Selection" (Dillon 1985a). Both the north half and the north half plus southwest parcel options were assessed. Examination of the latter "new" parcel was deemed a "sensitivity analysis".

Boundary refinement was designed to yield a site with a 20 year landfill life. The LF-3C site would provide more than 20 years of landfill life. A sensitivity analysis was conducted to determine the reduction in impacts and risks associated with deleting the lands east of Krick Road, the area which provides extra life.

Factor data and factor suitability levels for the site and site vicinity study areas for the new LF-3C and LF-1E parcels are contained in Tables 34 and 35.

TABLE 34: SITE BIOLOGY - FACTOR DATA AND FACTOR SUITABILITY LEVELS, ADDITIONAL PARCELS LF-3C AND LF-1E

FACTOR	LF-3C WEST OF KRICK ROAD	F.S.L.	LF-1E N PARCEL PLUS SW PARCEL	F.S.L.
Rare species	• 1 rare plant • no rare animals	-1	• 5 rare plant species • 1 rare animal species	-1
Natural vegetation displaced (ha) (without recently disturbed field)	52	-3	73	-5
Potential occurren18 of significant features	low	-1	high	-5

TABLE 35: SITE VICINITY BIOLOGY - FACTOR DATA AND FACTOR SUITABILITY LEVELS, ADDITIONAL PARCELS LF-3C AND LF-1E

FACTOR	LF-3C WEST OF KRICK ROAD	F.S.L.	LF-1E N PARCEL PLUS SW PARCEL	F.S.L.
Areal extent of SEUs (ha)	100	-1	386	-3
Areal extent of other nat. vegetation	321	-3	405	-3
Number of significant F. & W. features	4; 3 pike spawning and 1 waterfowl production area	-5	2 pike spawning areas	-3
Rare species	18 rare plants 3 rare animals	-5	5 rare plants 7 rare animals	-3

The "new" parcels are assessed only as part of a sensitivity analysis. The Dillon (1985a) site selection report describes the uses of the sensitivity analysis results.

The original Phase 4A parcels are described and assessed along with the other four siting options in Tables 16, 19, 26 and 28. The original parcels were carried forward into the comparative evaluation of siting options, Chapter 4.4.

Restriction of LF-3C to west of Krick Road reduces site constraint levels (F.S.L.) for both the natural vegetation displaced and potential for occurrence of significant features decreased when the area east of Krick Road is excluded from LF-3C. The site vicinity F.S.L.s remain the same for LF-3C, even with the addition of the lands east of Krick Road.

Exclusion of the lands east of Krick Road is expected to reduce the potential impact of facility development at LF-3C. The potential for impacts associated with LF-3C might be similar to that for LF-9C and the northern siting options.

The addition of the parcel in the SW corner of LF-1E increases the F.S.L. for natural vegetation on site from -3 to -5. The site vicinity factor suitability levels remain the same. The site F.S.L. change is not sufficient to alter ranking of LF-1E relative to other siting options.

4.4.2 PROVISION OF RAIL ACCESS

This sensitivity analysis considers the relative impact associated with transporting all additives and reagents

to the site via road versus the impact associated with transporting the compounds via rail. A generic assessment of potential impacts was completed, recognizing that the specific impacts would vary from site to site. For example, at PI-27E there would be no off-site impacts associated with rail facility construction, whereas at LF-9C almost 2 km of railway construction would be required.

Impacts associated with rail facility construction and operation would be in addition to road transportation impacts. Rail transport of additives and reagents would reduce truck traffic volumes by only approximately 10% (Dillon 1985b).

The objective of the sensitivity analysis was to determine whether siting option rank would be expected to change dramatically if the preferred rail option was constructed and operated.

It was determined that it was not feasible to provide rail access to the LF-4N/PI-13N siting option. Very minor negative impacts were expected for the following options: LF-4N/PI-1N, LF-3C, LF-1E, LF-1E/PI-27E. In all of these cases siting option rank was not expected to be affected by provision of rail access.

As noted previously, approximately 2 km of rail line would be built to LF-9C. Impacts associated with this facility are expected to be minor, or at most moderate relative to other facility components. Rail impacts would bring LF-9C closer to LF-4N/PI-13N, but both would still be ranked 1.

Based on an overview analysis, provision of rail access

is thought not to have major effects on ranking of siting options.

If rail access is to be provided to the preferred site, a more detailed analysis of potential impacts would be required during Phase 4B.

4.4.3 PARTIAL SOLIDIFICATION

The potential for evaporating portions of the waste stream is being explored. The implication of this technology on the biology of the study areas was reviewed in a preliminary fashion during Phase 4A.

The following assumptions were made based on information from the engineering and air resource consultants:

- any reduction in landfill area resulting from utilization of evaporation technology would be used to extend site life, thus the site size would remain the same;

- fogging and icing at ground level caused by use of the evaporation technique would occur infrequently and would have no off-site impact on natural vegetation;

- the evaporation technique would not create air or soil pollution loadings which would affect off-site natural vegetation.

Given the above assumptions it was concluded that the partial solidification option would create no negative

impacts on the biological resources of the site or site vicinity.

It was recommended that site-specific implications of partial solidification be assessed during Phase 4B.

Partial solidification is assumed to have no influence on results of the biology siting option comparison.

4.5 IMPACT PERSPECTIVE

The purpose of this section is to discuss the absolute significance of the impacts associated with construction and operation of the OWMC facility. This will answer the question -- what would be the significance of developing on the most highly constrained, or other, siting options?

Much of the area of most candidate sites has already been cleared of forest and other natural vegetation. Facility placement on all sites would be at a distance from permanent streams. There are no confirmed occurrences of endangered species on any of the sites.

None of the candidate sites are located within extensive natural areas which are not already influenced by human activities. Currently, woodlots on most sites are subjected to some level of disturbance due to sawlog and/or firewood cutting. Certain woodlots have been cut heavily. On PI-217E, for example, tree clearing has occurred over several hectares. Future industrial development on this site would involve further vegetation clearing.

None of the sites or site vicinities contain areas which were considered to be among the top unprotected natural areas in the Carolinian Life Zone in Canada (World Wildlife Fund Canada 1984).

Most of the sites avoid Significant Environmental Units (SEU), although wooded SEU patches on LF-1E would be lost. These forest areas are part of a larger complex of small woodlots which were designated as SEU. Loss of a portion of

the multi-segmented unit may not have significant effects on the present environmental functions. It is probable that most, if not all of the species present on LF-1E occur elsewhere within the SEU or adjacent woodlots. Although the forests on LF-1E may be among the more significant wooded areas, it is important to note that only about 20 ha of forest would be cleared. Together with other cover types such as thicket and old field, only 55 ha of natural vegetation would be lost for LF-1E.

The Brady SEU report clearly indicates that rare deciduous forest tree species, as designated by Dr. Argus and his colleagues, occur in many woodlots in the Niagara Peninsula.

Based on existing knowledge, we are aware of no species whose regional distribution is limited to the candidate sites. Thus, construction of the proposed facility will not eliminate any rare species from any of the regional municipalities in which the sites occur. Furthermore, the rare species reported near or on the sites are known from other locations in southern Ontario.

As noted in Tables 14 and 24, many of the species designated as rare are viewed as being of limited significance. Some are numerous and widespread in the region, some are increasing in abundance and reports of certain species have not been confirmed.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

- Phase 4A has provided a more detailed comparison of biological conditions on the candidate sites than was possible in Phase 3B.

- All sites passed the basic acceptability screen for biology.

- Siting options were placed in three groups when ranked. Differences among several siting options were minimal for biology factors.

- The LF-1E/PI-27E option was clearly the least preferred of the six siting options subjected to the detailed comparative evaluation.

- LF-9C was placed with the two northern siting options in a group of the three most preferred sites from a biological perspective.

- It was concluded through sensitivity analysis, that certain boundary refinements, provision of rail access, and partial solidification would not create major differences in siting option ranking.

5.2 RECOMMENDATIONS

Recommendations include the following:

- It is recommended that detailed year-round investigation of biological conditions on the preferred site and other appropriate study areas be completed during Phase 4B;

- Phase 4B data collection should be designed to provide a baseline for long-term monitoring of environmental conditions in the study area;

- Appropriate mitigative measures should be implemented to minimize impacts on biological resources which might be affected by construction, maintenance and operation of OWMC facilities.

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Ms. J. Webber	Erindale College, University of Toronto
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Mr. & Mrs. H. Black	Chippawa Watershed Assoc.

Person	Agency/Affiliation
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Mrs. Mary Dinga	West Lincoln Task Against Toxic Waste
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Ms. Gretchen deBoer	City of Niagara Falls
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Mr. Dave McLeish	Maple District - OMNR
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****

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APPENDICES

APPENDIX A - OWMC PHASE 4A BIOLOGY FACTORS FOR SITE SELECTION

APPENDIX B - GLOSSARY OF TERMS

APPENDIX C - BASE MAPS SHOWING REFINED BOUNDARIES, ACCESS ROAD OPTIONS AND RAIL ACCESS OPTIONS

APPENDIX A

FACTOR SHEETS

APPENDIX A

FACTOR SHEETS

The factor sheets are organized into two groups:
1) Data collection factors and (2) Applied factors.

Early in the Phase 4A process, major issues (or factors) for which information was required were identified. These factors helped to focus the data collection exercise. The factors and indicators which were used during the data collection phase are described in the first set of factor sheets. These factors provide the organizational framework for the technical appendices (site reports).

When the data obtained were reviewed and analytical methods were applied it was found that, in some cases, different factors and indicators were more appropriate to use in the comparative evaluation of siting options. Descriptions of the "applied" factors and indicators and a rationale for their use is outlined in the second group of factor sheets. In several cases, the factors remained the same but the indicators were revised to reflect the data base available and the study objectives.

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DATA COLLECTION FACTOR SHEETS

DATA COLLECTION FACTORS AND INDICATORS

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	• Fish and wildlife communities	(1) species lists (2) extent and types of aquatic habitat (3) extent and types of terrestrial wildlife habitat (4) number and significance of special habitats	A-7
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OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison, Boundary Refinement

DEFINITION OF FACTOR:
Plant and animal species which have populations of limited size and distribution are considered rare. Rarity is often assigned on a geographic basis, e.g. national, provincial and regional. "Rare" is used here in a broad sense and covers such designations as endangered, threatened, and regionally, provincially or nationally rare.

Rarity was determined by a review of published documents and by discussions with experts who have a knowledge of the status of rare species. The definitions of rarity used by these experts were evaluated and adopted where appropriate.

RATIONALE/SIGNIFICANCE OF FACTOR:
Certain rare species and their habitats are "protected" in provincial legislation under the 'Endangered Species Act'. Construction, operation and maintenance of facilities should not interfere with species cited in legislation.

The occurrence of non-legislated and regionally rare species should also be identified so that site selection and design concepts consider potential constraints associated with these species. This factor contributes to attaining the goal of minimizing impact on the natural environment.

Rare species are often of special educational and scientific interest. Populations at the edge of a species' distribution range may contain a significant gene pool.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

INTERPRETATION/METHODOLOGY:
Rarity was determined by reference to key documents on plant and animal species status. The significance of rarity designations was evaluated on a species-by-species basis, e.g. regional vs. provincial and national designations. Discussions with experts augmented the document review process. To the extent that the data base allowed, locations, numbers and condition of rare species populations were evaluated.

Opinions of local experts on past status changes in species were an additional element in evaluation and interpretation.

INDICATORS:
(1) Number of Rare Species

DEFINITION: Simply the number of species occurring on the site which have been designated as rare.

RATIONALE/SIGNIFICANCE:
The number of rare species reported is one indication of the environmental significance of a geographic unit. We have assumed that the more rare species one encounters in a relatively small area (OWMC candidate sites), the more difficult it may become to locate constraint-free lands and the higher the probability of creating an environmental impact. Large numbers of rare species may indicate the existence of significant habitats or biological associations which are also potential constraints to facility development.

SOURCES OF INFORMATION:
The following sources of information were available:

- published reports on species status and distribution
- agency contact
- public interest group contact

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	DATA COLLECTION FACTOR:
Natural Environmental Impacts	Rare Species

SOURCES OF INFORMATION: (CONT'D)

- interview forms
- field work

INPUT FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- rare animal species and certain rare plant species occurrence may vary from year to year
- literature on species sensitivity may be limited

(2) Number of Individuals of each Rare Species

DEFINITION: The number of each rare species on the site.

RATIONALE/SIGNIFICANCE OF FACTOR:
Population size is an indicator of rare species status on the site. Population trends may provide insight into the health and reproductive success of the population. This information could be used in impact prediction. For example, if the population is small, has been declining and is sensitive to the type of activities associated with treatment facility development, the rare species may constitute a constraint. If, however, the species has a relatively large or expanding population the potential constraint or impact may not be as great.

SOURCES OF INFORMATION:
Potential sources of on-site rare species population size information include:

- field work
- discussions with local experts and residents

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- site specific knowledge of rare species population sizes may be incomplete or outdated
- determining trends in rare species population size may be difficult
- population size may vary from year to year
- detailed field work (Phase 4B) will be required before a sound knowledge of rare species populations is achieved

(3) On-site Distribution

DEFINITION: The physical pattern of occurrence of each rare species.

RATIONALE/SIGNIFICANCE:
The location of rare species occurrence and patterns of distribution facilitates impact prediction. If rare species are clustered, these locations would potentially be high constraint areas. To minimize environmental impact, facilities could be designed and operated to avoid displacement and mitigate other potential impact in these critical areas.

SOURCES OF INFORMATION:
- field work
- discussions with local experts and residents

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific information may be incomplete or outdated
- patterns of distribution may change from year to year
- detailed field work (Phase 4B) will be required before a sound knowledge of rare species distribution patterns is achieved.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison, Boundary Refinement

DEFINITION OF FACTOR:
Fish and wildlife communities are the complex of animal populations that interact with each other. Both common and any rare species contribute to these communities. This factor also considers habitat as an essential element in maintenance of populations.

RATIONALE/SIGNIFICANCE OF FACTOR:
Fish and wildlife communities represent a significant element of the natural environment and are of concern because of their potential economic and recreational value. They provide an index of natural environmental quality; thus, potential for loss or alteration of fish and wildlife communities is a significant consideration in impact prediction.

INTERPRETATION/METHODOLOGY:
Community types were determined by direct observation, from existing information and habitat interpretation. A species list was prepared for each site which, although incomplete, indicates the types of fish and wildlife communities present. Significant and rare species received further analysis. Communities were characterized for convenience by habitat type, e.g. forest or old field fauna; warm or cold water fish communities.

Since site specific background information was limited, it was necessary to augment species lists with a determination of the extent and type(s) of aquatic and terrestrial habitat present on site.

It should be noted that although detailed field work would be required to document all aspects of fish and wildlife community

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

INTERPRETATION/METHODOLOGY: (cont'd)
structure, this is not required for the comparative evaluation. The data base available during Phase 4A is adequate for relative comparisons of candidate sites.

INDICATORS:
(1) Species List

DEFINITION: Names of the kinds of fish and wildlife which have been recorded on the site.

RATIONALE/SIGNIFICANCE:
The variety of species on the lists depend on sampling effort, season and skill of observers. If interpreted with caution, site lists can be used for the following purposes:

- to identify the existence of rare species
- to characterize communities present
- to provide an indication of the variety of fish and wildlife species

SOURCES OF INFORMATION:
- agency information
- special interest groups
- local experts
- interview forms
- field work
- Ontario Breeding Bird Atlas
- trappers
- bait fishermen

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- separate lists were prepared for fish, reptiles and amphibians, birds, mammals and butterflies
- the species lists are incomplete
- certain rare, significant or sensitive species may be missed because of the nature of the data collection process at this stage
- the species lists provide those who have not visited the site with an indication of the fish and wildlife communities which occupy the site
- available information facilitate the detailed comparative evaluation of candidate sites

(2) Extent and Types of Aquatic Habitat

DEFINITION: The number, approximate size and type of water bodies present on the site. These waters were evaluated as habitat for fish and aquatic wildlife populations.

RATIONALE/SIGNIFICANCE:
Since the variety of species and density of fish and aquatic wildlife population on each site was not directly determined at this time, the significance of sites for life associated with aquatic areas was inferred through habitat evaluation. The areal extent of habitat present influences the variety of species present and the number of individuals which can be supported. Certain species prefer streams over ponds, so the mix of habitat types will influence the variety of aquatic wildlife present. Permanent streams and ponds may differ in value from temporary water bodies.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

RATIONALE/SIGNIFICANCE:(cont'd)
The presence of aquatic habitat on a site represents an additional dimension in the natural environment. Presence of water also enhances habitat capability for terrestrial species.

Site development may displace or modify aquatic habitat. Such changes were considered as part of the impact analysis.

SOURCES OF INFORMATION:

- air photos, topographic maps
- agency information, e.g. stream survey reports
- local experts
- interview forms
- field work

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- aquatic habitat types such as permanent or temporary streams or ponds, warm or cold water streams provide valuable indicators of the types of fish and wildlife communities to expect
- confirmation of species which actually use the habitats identified was limited
- habitat type was described on the basis of water body type, e.g. streams, lake, and permanence
- connections of water bodies to off-site areas is a significant consideration from an environmental function perspective

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

(3) Extent and Types of Terrestrial Wildlife Habitat:

DEFINITION: The number and pattern of vegetation cover types and extent of cover types which provide habitat for land animals.

RATIONALE/SIGNIFICANCE:
Since the variety of species and density of terrestrial wildlife populations on each site were not directly determined, the significance of sites for terrestrial wildlife was inferred through habitat evaluation. The areal extent of natural vegetation present influences the variety of species present. The variety and interspersion of vegetation cover types influences the variety of animal life which inhabits an area.

Site development may displace or modify vegetation patterns and other components of terrestrial habitat. Such changes were considered as part of the impact analysis.

SOURCES OF INFORMATION:
- air photos, topographic maps, Forest Resource Inventory maps
- agency information
- local experts
- interview forms
- field work

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- vegetation cover types, patterns and extent provide valuable indicators of the types of bird and mammal communities to expect
- habitat type was described on the basis of expected animal communities, e.g. forest, "edge", field
- connections of habitat to off-site areas may be a significant consideration from an environmental function perspective, e.g. movement corridor
- habitat assessments concentrated on bird and mammal species requirements

(4) Number and Significance of Special Habitats

DEFINITION: Special habitats are areas where concentrations of certain species occur during critical periods of their life cycles. These critical periods include: over-wintering and reproduction areas. Examples of special habitats include heronries, fish spawning beds, deer yards, and major waterfowl staging areas.

RATIONALE/SIGNIFICANCE:

Special habitats are significant for the following reasons:

- may be essential for critical periods of life cycle, e.g. a year's recruitment or a high mortality probability period
- large numbers of individuals are usually involved in concentrated locations
- the habitat may have characteristics which do not occur widely, e.g. upwelling in fish spawning substrate
- often they cannot be simulated by man-made structures
- agencies and the public are concerned about such habitats

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Communities

SOURCES OF INFORMATION:

- agency information
- local experts
- public contact
- field work

INPUTS FROM OTHER CONSULTANTS:

None

STUDY AREA:

Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- the number and location of special habitats will probably be known, the significance of habitats may vary from year to year if levels of use change; thus, significance assessment may be qualitative
- detailed site work (Phase 4B) may discover special habitats which were previously undocumented, but this is unlikely

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTION:
Siting Option Comparison, Boundary Refinement

DEFINITION OF FACTOR:
Natural vegetation is defined as plant life which can thrive without sustained human management, e.g. forest, old field, marsh; in contrast to agricultural crops. Vegetation communities are the complex of plant populations occupying an area. Both common and any rare species contribute to these communities. This factor also considers habitat as an essential element in the maintenance of populations.

RATIONALE/SIGNIFICANCE OF FACTOR:
Natural vegetation communities represent a significant element of the natural environment, e.g. it provides wildlife habitat and stabilizes soil. Natural vegetation is also of potential economic and recreational value.

INTERPRETATION/METHODOLOGY:
Community types were determined by air photo interpretation and were confirmed by direct observation. A species list was prepared for each site which, although incomplete, indicates the types of vegetation communities present. Significant and rare species received further analysis. Communities were described on the basis of cover types.

It should be noted that although detailed field work would be required to document all aspects of natural vegetation community structure, this is not required for the comparative evaluation. The data base available during Phase 4A is adequate for relative comparisons of candidate sites.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

INDICATORS:
(1) Species List

DEFINITION: Names of the kinds of vegetation which have been recorded on the site.

RATIONALE/SIGNIFICANCE:
The variety of species on the list depends on sampling effort, season and skill of observers. If interpreted with caution, site lists can be used for the following purposes:

- to identify the existence of rare species
- to characterize communities present
- to provide an indication of the variety of vegetation species present

SOURCES OF INFORMATION;
- agencies
- special interest groups
- local experts
- interview forms
- National Museum of Natural Sciences
- field work
- citizens' groups

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- the species lists provide those who have not visited the site with an indication of the natural vegetation communities which occupy the site

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

COMMENTS/ASSUMPTIONS/LIMITATIONS: (cont'd)

- the species lists are incomplete
- certain rare, significant or sensitive species may be missed because of the nature of the data collection process at this stage
- available information facilitate the detailed comparative evaluation of candidate sites

(2) Areal Extent of Natural Vegetation Patches

DEFINITION: The area, in hectares, covered by natural vegetation

RATIONALE/SIGNIFICANCE:
The area covered by natural vegetation provides an indication of the amount of habitat for natural vegetation species and wildlife.

SOURCES OF INFORMATION:

- aerial photos
- topographic maps
- field checking of vegetation unit boundaries

INPUTS FROM OTHER CONSULTANTS:
Cross-check of data with Ecologistics Limited

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- areas of natural vegetation are approximate
- areas may change from year to year depending upon cultivation patterns
- forest plus shrub thicket, marsh, old field and other vegetation types contribute to natural vegetation area

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

(3) Variety of Natural Vegetation Cover Types

DEFINITION: The number of types of natural vegetation assemblages present. Examples of cover types include shrub thicket, marsh, old field.

RATIONALE/SIGNIFICANCE:
There is evidence to suggest that a variety of vegetation cover types provides habitat for a greater variety of plant and wildlife species than does a single cover type. This assumes that each cover type is present in sufficient quantity. Number of cover types is one measure of habitat diversity.

SOURCES OF INFORMATION:
- air photo interpretation
- field checking

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- certain cover types were subdivided into upland and lowland units
- each cover type is described in the Phase 4A Biology Protocol contained in each site technical appendix

(4) Number and Extent of Special Associations and Significant Environmental Units (SEUs)

DEFINITION: Special Associations - The number of and area covered by significant natural vegetation complexes. Examples of special associations include prairie relict, savannah and alvar.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

Significant Environmental Unit - the number of and area covered by areas which contain special environmental attributes or which perform significant environmental functions.

Component types of SEUs include:
- Environmentally Significant (Sensitive) Areas - ESAs
- Areas of Natural and Scientific Interest - ANSIs
- Areas of Important Biological Resources - AIBRs

RATIONALE/SIGNIFICANCE:
Special vegetation associations are significant because they have limited geographic distribution. Distribution may be limited because the association requires environmental conditions which are met in few places and/or because former distribution has been decreased by modern land use.

SEUs may:
- contain populations of rare or uncommon plants or animals
- perform significant environmental functions
- provide habitat for species which require extensive territories
- contain biological associations or communities which are poorly represented elsewhere
- maintain a significant warm water fishery which provides fishing opportunities
- serve as cold water fishery migratory routes
- contain habitat for, or populations of, recreationally or economically important species, e.g. bait fish
- represent significant earth science features

SOURCES OF INFORMATION:
- existing reports
- discussion with experts, ministries and agencies
- field work

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Natural Vegetation Communities

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Although field work for certain of the SEU studies was conducted nine or more years ago, and the status of species which justified designation in the past may have changed, we assume that habitat for significant species is still intact in the SEUs.
- Most of the SEUs are not designated in approved official plans of Regional Municipalities
- Limitations in the scale or quality of mapping for certain AIBRs and ANSIs limited the accuracy with which certain SEU boundaries could be delineated.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

DATA COLLECTION FACTOR:
Biological Resource Use

FACILITY COMPONENTS AFFECTED:
All facilities on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Biological resource use is the on-site harvest of wild plants and animals by humans. Indicators of the factor represent the four major uses expected on candidate sites: forestry, trapping, hunting and fishing.

RATIONALE/SIGNIFICANCE OF FACTOR:
Displacement of biological resources by construction of OWMC facilities may create an impact by interfering with resource harvesting. Biological resource use may involve recreational and economic value.

INTERPRETATION/METHODOLOGY:
Existing use of forest products and fish and wildlife was determined by discussion with residents and via "Walk-and-Talk" questionnaires. The types of existing uses and an indication of the significance of the use was documented.

INDICATORS:

(1) Forestry

DEFINITION: Harvest of wood products from forests. Examples of uses include sawlogs, firewood, veneer logs. The indicator addresses the relative level of forestry activity.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Biological Resource Use

RATIONALE/SIGNIFICANCE:
Farm woodlots may be significant sources of firewood for landowners. Income may be augmented by sale of sawlogs and veneer logs. The potential for interference with existing forestry use on candidate sites may be considered in the comparative evaluation.

SOURCES OF INFORMATION:
- agency information
- interview forms
- field observations
- discussions with landowners

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- this indicator contributes to a relative comparison of biological resource use among siting options
- forestry use is not defined in economic terms in this assessment

(2) Trapping

DEFINITION: Harvest of furbearers. Examples of species captured in study area include: muskrats, red fox, raccoon. The indicator addresses the relative level of trapping activity.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Biological Resource Use

RATIONALE/SIGNIFICANCE:
The lands and watercourses on the site may be sources of fur for landowners and other authorized individuals. The potential for interference with existing trapping on candidate sites may be considered in the comparative evaluation.

SOURCES OF INFORMATION:
- agencies
- interview forms
- discussions with landowners and local trappers

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- this indicator contributes to a relative comparison of biological resource use among siting optins
- trapping use is not defined in economic terms in this assessment

(3) Hunting

DEFINITION: Stalking and shooting birds and animals for recreation and consumption. The indicator addresses the types and relative level of hunting activity.

RATIONALE/SIGNIFICANCE:
Hunting on the candidate sites may provide recreational opportunities for landowners and other authorized individuals. The potential for interference with existing hunting on candidate sites may be considered in the comparative evaluation.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

DATA COLLECTION FACTOR:
Biological Resource Use

SOURCES OF INFORMATION:
- agencies
- interview forms
- discussions with landowners

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- this indicator contributes to a relative comparison of biological resource use among siting options.

(4) Fishing

DEFINITION: Capturing fish for recreation, consumption or as bait. The indicator addresses the types and relative level of fishing activity.

RATIONALE/SIGNIFICANCE:
Fishing on the candidate sites may provide recreation and economic benefits. The potential for interference with existing fishing on candidate sites may be considered in the comparative evaluation.

SOURCES OF INFORMATION:
- agencies
- interview forms
- discussions with landowners and bait fishermen

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Biological Resource Use

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- this indicator contributes to a relative comparison of biological resource use among siting options
- fishing activity is not defined in economic terms in this assessment

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Plant and animal species which have populations of limited size and distribution are considered rare. Rarity is often assigned on a geographic basis, e.g. national, provincial and regional. "Rare" is used here in a broad sense and it covers such designations as endangered, threatened, and regionally, provincially or nationally rare.

Rarity was determined by a review of published documents and by discussions with experts who have a knowledge of the status of rare species. The definitions of rarity used by these experts were evaluated and adopted where appropriate.

RATIONALE/SIGNIFICANCE OF FACTOR:
Certain rare species and their habitat are "protected" in provincial legislation under the 'Endangered Species Act'. Construction, operation and maintenance of facilities should not create off-site interference with species cited in legislation.

The occurrence of non-legislated and regionally rare species should also be identified so that site selection and design concepts consider potential constraints associated with these species. This factor contributes to attaining the goal of minimizing impact on the natural environment.

Rare species are often of special educational and scientific interest. Populations at the edge of a species' distribution range may contain a significant gene pool.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

INTERPRETATION/METHODOLOGY:
Rarity was determined by reference to key documents on plant and animal species status. The significance of rarity designations was evaluated on a species-by-species basis, e.g. regional vs. provincial and national designations. Discussions with experts augmented the document review process.

INDICATORS:
(1) Number of Rare Species

DEFINITION: Simply the number of species, found in the site vicinity, which have been designated as rare.

RATIONALE/SIGNIFICANCE:
The number of rare species found is one indication of the environmental significance of an area. We have assumed that the more rare species encountered in a site vicinity, the higher the probability of creating an environmental impact. Large numbers of rare species may indicate the existence of significant habitats or biological associations which are potentially sensitive to off-site impacts associated with facility development and operation.

SOURCES OF INFORMATION:
The following potential sources of information are available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Rare Species

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- rare animal species and certain rare plant species occurrence may vary from year to year

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
These features represent habitat which is essential to key periods in the life history of certain fish and wildlife species. Examples of fish and wildlife features of significance include: heronries, deer wintering areas, significant fish spawning sites and waterfowl staging areas.

This factor addresses significant biological features other than those covered by the rare species factors and in areas other than those occupied by SEUs.

RATIONALE/SIGNIFICANCE OF FACTOR:

Potential exists for undefined off-site impacts on fish and wildlife resulting from the proposed development. Phase 4A research has yielded the location of certain significant fish and wildlife features. These significant features represent habitat where concentrations of animals occur, for example, during the breeding season. The locations of significant features relative to sites were considered during the comparative evaluation of sites.

INTERPRETATION/METHODOLOGY:
Locations of significant fish and wildlife features were mapped. The shortest distance between the site boundary and each feature was measured in kilometres. During the comparative evaluation, the type of feature was described and the potential for impact was determined subjectively, taking into account the distance between the site and the feature and what is

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

INTERPRETATION/METHODOLOGY: (cont'd)
known about facilities proposed for the site. The number of significant feature occurrences and relative level of impact were reviewed to determine the overall potential for impact on these features.

INDICATOR:
(1) Distance from site to features

DEFINITION: Shortest distance between the site boundary and each fish and wildlife feature of significance. Measured in kilometres.

RATIONALE/SIGNIFICANCE:
The magnitude and potential for occurrence of many impacts decreases with distance from the source of the impact agent. As a broad generalization, distance between the source and receptor is an indicator of impact potential. The location of significant fish and wildlife features outside of SEUs is known and distances can be measured between the site and these features.

SOURCES OF INFORMATION:
Agencies and the public, especially local experts and special interest groups, were important data sources. A review of reports and literature was also completed to determine where significant fish and wildlife resources occurred within each site vicinity. Field checks were not required as input to a comparative evaluation.

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- it is assumed that there is some as yet unknown potential for creating impact, associated with the OWMC facilities; these impacts would involve fish and wildlife features
- the validity of this indicator is based on the assumption that the distance between the impact source and possible receptors influences potential for impact
- the methodology involves subjective evaluations, but examination of the distances from facilities to significant features will provide information with which to compare candidate sites

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

DATA COLLECTION FACTOR:
Other natural vegetation

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
All other areas of natural vegetation, excluding SEUs. Forest, thicket, field and marsh vegetation cover types are included. "Natural" vegetation is defined as plant life which can thrive without sustained human management, in contrast to agricultural crops.

RATIONALE/SIGNIFICANCE OF FACTOR:
This factor represents the areal extent of natural vegetation within the site vicinity envelope. Natural vegetation, whether forest, old field or wetland, provides living space for a variety of plant and animal species. A number of as yet poorly defined, potential impacts may be associated with the OWMC facilities. Loss of trees due to changes in drainage patterns and soil moisture regimes on the site perimeter, is an example of a potential site vicinity impact.

The areal extent of natural vegetation within each site vicinity was measured and was used as an index of potential impact on the natural environment of each site vicinity.

INTERPRETATION/METHODOLOGY:
Natural vegetation units greater than 2 ha in area were identified and assigned a cover type. Forest Resource Inventory (FRI) maps were used as a data source. Recent (1984) air photos at a scale of 1:10,000 were used to verify FRI data, to update unit boundaries and to assign a cover type to units not addressed by FRI. Field truthing was not completed.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Other natural vegetation

INTERPRETATION/METHODOLOGY: (cont'd)
The areal extent of other natural vegetation was measured by counting squares of metric graph paper and was rounded to the nearest hectare.

INDICATOR:
(1) Areal Extent Within Site Vicinity

DEFINITION: Area rounded to nearest hectare of natural vegetation between the site and site vicinity boundary.

RATIONALE/SIGNIFICANCE:
The area covered by natural vegetation provides a general approximation of the potential for impact on the natural environment.

For purposes of a relative comparison between the candidate sites, the areal extent of natural vegetation within the site vicinity envelope provides a broad indication of potential for impact on plant species and wildlife associated with natural vegetation.

SOURCES OF INFORMATION:
Forest Resource Inventory maps prepared by the Ministry of Natural Resources (1979) show woodlots and other treed areas. Air photos (1984) were used to check cover types and update boundaries. Vegetation types and unit boundaries were checked against maps prepared by the agricultural consultant, Ecologistics Limited.

INPUTS FROM OTHER CONSULTANTS:
Vegetation data were discussed with Ecologistics Limited.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Other natural vegetation

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- We have assumed that noise, lighting, fencing, and traffic associated with OWMC facilities will have the potential for creating as yet undefined impacts on the natural environment of the site vicinity
- We have assumed that the potential for impact on site vicinity vegetation and wildlife populations not within SEUs, is proportional to the areal extent of natural vegetation
- Special features and attributes, rare species, etc., are dealt with on other site vicinity factor sheets
- Designation of cover type for certain fields from the air photos was difficult and may change from year to year
- During Phase 4B there will be a need to define potential impact agents and the location of sensitive receptors; that is, a more detailed assessment of site vicinity impacts will be required

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Significant Environmental Unit (SEU) is a term coined to refer collectively to a number of types of areas which contain special environmental attributes or which perform significant environmental functions. SEUs have been identified in existing reports.

Component types of SEUs include:
- Environmentally Significant (Sensitive) Areas - ESAs
- Areas of Natural and Scientific Interest - ANSIs
- Areas of Important Biological Resources - AIBRs

RATIONALE/SIGNIFICANCE OF FACTOR:
This factor relates to the objective of minimizing impact on the natural environment.

SEUs may:
- contain populations of rare or uncommon plants or animals
- perform significant environmental functions
- provide habitat for species which require extensive territories
- contain biological associations or communities which are poorly represented elsewhere
- maintain a significant warm water fishery which provides fishing opportunities
- serve as cold water fishery migratory routes
- contain habitat for, or populations of, recreationally or economically important species, e.g. bait fish
- represent significant earth science features

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE OF FACTOR: (cont'd)

SEU mapping indicates the location and geographic extent of areas known to possess significant environmental features and/or to perform significant environmental functions.

Knowledge of the location of SEUs and distances to site margins is of value in identifying potential off-site impacts of OWMC facilities. The relative potential for off-site impacts could be used in the comparative evaluation of facility options.

INTERPRETATION/METHODOLOGY:

The location and extent of SEUs, within site vicinities is known from Phase 3B; these were mapped. The distance between the site boundaries and the edge of the SEUs was determined and was used as a broad indication of potential for impact.

More precise impact prediction cannot be completed at this time because details of facility components are not known and biological conditions in the SEU have not been confirmed.

The present evaluation is comparative and seeks to identify major differences between potential for impact on biological conditions around each site.

SEUs represent areas where significant environmental conditions have been recorded in the past. Many SEUs represent areas with high potential for providing fish and wildlife habitat.

INDICATOR:

(1) Distance from site to SEU

DEFINITION: Shortest distance between the site boundary and the SEU boundary. Distance measured in kilometres.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE:
The magnitude and potential for occurrence of many impacts decreases with distance from the source of the impact. As a broad generalization, distance between source and receptor is an indicator of impact potential. Distances between source and specific receptors cannot be calculated at this time because the full range of sensitive receptor species which may exist in the SEU is not known. Thus, distances were measured between margins of sites and SEUs.

SOURCES OF INFORMATION:
Reports which identify SEUs in drainage basins and Regional Municipalities located within the Candidate Areas were utilized. Only regional overview studies and types of analyses which were applied in all Candidate Areas were accessed. Environmental feature data contained in local planning documents such as a city's official plan were not used since the approach to and scope of identification of significant environmental features and designation assigned may vary from plan to plan.

Sources used included reports prepared by or for Conservation Authorities and Regional Municipalities, Ministry of Natural Resources' Areas of Natural and Scientific Interest files, District Land Use Guidelines, a fish migration route map and discussion with Conservation Authorities, Municipalities and Ministry of Natural Resources District and Regional and Head Office staff.

During Phase 4A, discussions were held with authors and agencies who had prepared SEU source reports.

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**DATA COLLECTION FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- The validity of this indicator is based on the assumption that the distance between source and possible receptors reflects potential for impact, and that significant receptors exist in the SEUs.
- We have assumed that drainage, noise, lighting, fencing, and traffic associated with OWMC facilities will have the potential for creating, as yet undefined, impacts on SEUs existing in the site vicinities.
- Although field work for certain of the SEU studies was conducted 9 or more years ago, and the status of species which justified designation in the past may have changed, we assume that habitat for significant species is still intact in the SEUs.
- Most of the SEUs are not designated in approved official plans of Regional Municipalities.
- Limitations in the scale or quality of mapping for certain AIBRs and ANSIs limited the accuracy with which certain SEU boundaries could be delineated.
- Despite the limitations indicated above, considerations of SEUs during the comparative evaluation is important as these areas are known to contain significant environmental features and to be of concern to certain agencies.

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OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

APPLIED FACTOR:
Rare Species

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Plant and animal species which have populations of limited size and distribution are considered rare. Rarity is often assigned on a geographic basis, e.g. national, provincial and regional. "Rare" is used here in a broad sense and covers such designations as endangered, threatened, and regionally, provincially or nationally rare.

Rarity was determined by a review of published documents and by discussions with experts who have a knowledge of the status of rare species. The definitions of rarity used by these experts were evaluated and adopted where appropriate.

RATIONALE/SIGNIFICANCE OF FACTOR:
Certain rare species and their habitats are "protected" in provincial legislation under the 'Endangered Species Act'. Construction, operation and maintenance of facilities should not interfere with species cited in legislation.

The occurrence of non-legislated and regionally rare species should also be identified so that site selection and design concepts consider potential constraints associated with these species. This factor contributes to attaining the goal of minimizing impact on the natural environment.

Rare species are often of special educational and scientific interest. Populations at the edge of a species' distribution range may contain a significant gene pool.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

INTERPRETATION/METHODOLOGY:
Rarity was determined by reference to key documents on plant and animal species status. The significance of rarity designations was evaluated on a species-by-species basis, e.g. regional vs. provincial and national designations. Discussions with experts augmented the document review process. To the extent that the data base allowed, locations, numbers and condition of rare species populations were evaluated.

Opinions of local experts on past status changes in species were an additional element in evaluation and interpretation.

INDICATORS:
(1) Number of rare plant species

DEFINITION: Number of plant species which meet the broad definition "rare".

RATIONALE/SIGNIFICANCE:
The number of rare plant species reported is one indication of the environmental significance of a study area. We have assumed that the more rare plant species one encounters in a relatively small area (OWMC study sites), the more difficult it may become to locate constraint-free lands and the higher the probability of creating an environmental impact. Large numbers of rare plant species may indicate the existence of significant habitats or biological associations which are also potential constraints to facility development.

SOURCES OF INFORMATION:
The following sources of information were available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms
- field work

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare plant species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- certain rare plant species occurrence may vary from year to year
- literature on species sensitivity may be limited
- rare plant and animal species are separated for a number of reasons: differences in susceptibility to certain types of impact, differences in habitat requirements, differences in reliability of reported occurrences

(2) Number of Rare Animal Species

DEFINITION: Number of animal species which meet the broad definition "rare".

RATIONALE/SIGNIFICANCE:
The number of rare animal species reported is one indication of the environmental significance of a geographic unit. We have assumed that the more rare animal species one encounters in a relatively small area (OWMC study sites), the more difficult it may become to locate constraint-free lands and the higher the probability of creating an environmental impact. Large numbers of rare animal species may indicate the existence of significant habitats or biological associations which are also potential constraints to facility development.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

SOURCES OF INFORMATION:
The following sources of information were available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms
- field work

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- rare animal species occurrence may vary from year to year
- literature on species sensitivity may be limited
- rare plant and animal species are separated for a number of reasons: differences in susceptibility to certain types of impact, differences in habitat requirements, differences in reliability of reported occurrences

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

APPLIED FACTOR:
Natural Vegetation Displaced

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Natural vegetation is defined as plant life which can thrive without sustained human management, e.g. forest, old field, marsh; in contrast to agricultural crops. Displaced vegetation would be the plant life removed as a consequence of earth moving or other construction activity.

RATIONALE/SIGNIFICANCE OF FACTOR:
Natural vegetation cover represents a significant element of the natural environment, e.g. it provides wildlife habitat and stabilizes soil. Natural vegetation is also of potential economic and recreational value.

INTERPRETATION/METHODOLOGY:
Natural vegetation distribution was determined by air photo interpretation and was confirmed by field observation. Measurements of vegetation area are approximate because distribution of certain cover types may vary from year to year due to agricultural activities.

INDICATORS:
(1) Areal extent

DEFINITION: The area, in hectares, covered by natural vegetation.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Natural Vegetation Displaced

RATIONALE/SIGNIFICANCE:
The area covered by natural vegetation provides an indication of the amount of habitat for natural vegetation species and wildlife.

SOURCES OF INFORMATION:
- aerial photos
- topographic maps
- field checking of vegetation unit boundaries

INPUTS FROM OTHER CONSULTANTS:
Cross-check of data with Ecologistics Limited.

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- areas of natural vegetation are approximate
- areas may change from year to year depending upon cultivation patterns
- forest, plus shrub thicket, marsh, old field and other vegetation types contribute to natural vegetation area
- the extent of natural vegetation represents a measure of wildlife habitat area

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

APPLIED FACTOR:
Potential for Occurrence of Additional Significant Biological Features

FACILITY COMPONENTS AFFECTED:
All facilities, on site

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Relative probability of finding more biological constraints during further detailed studies of a siting option.

RATIONALE/SIGNIFICANCE OF FACTOR:
Although they are adequate for a relative comparison of siting options, there are differences in the quantity and quality of site biology data. These differences result from variation in the amount and quality of data available from residents, citizens' groups, agencies and special interest groups. Because of the geographic location, site conditions, and surrounding land use, we know that the potential for occurrence of significant features differs among sites. Failure to acknowledge these differences may lead to an underestimate of potential impact associated with development of certain sites.

INTERPRETATION/METHODOLOGY:
The amount and quality of existing data were reviewed. Other Phase 4A information, such as natural vegetation and water patterns, and rare species occurrence was also reviewed for each site. Potential for occurrence was expressed as one of three relative levels: high, medium and low. Levels were assigned in the context of conditions occurring among the OWMC sites. Choice of level was based on professional opinion.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Potential for Occurrence of Additional Significant Biological Features

INDICATOR:
(1) Potential

DEFINITION: An estimate of the relative probability of identifying additional biological constraint as a result of detailed field work.

RATIONALE/SIGNIFICANCE:
Assessment of potential for occurrence of additional significant biological features is viewed as a necessary component of the detailed comparative evaluation. This factor assists in minimizing potential bias due to differences in existing data and in recognizing inherent differences between sites which would be known in detail only after detailed field work.

SOURCES OF INFORMATION:
- existing reports
- Phase 4A field work

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- potential levels are assigned on the basis of professional judgement

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Plant and animal species which have populations of limited size and distribution are considered rare. Rarity is often assigned on a geographic basis, e.g. national, provincial and regional. "Rare" is used here in a broad sense and it covers such designations as endangered, threatened, and regionally, provincially or nationally rare.

Rarity was determined by a review of published documents and by discussions with experts who have a knowledge of the status of rare species. The definitions of rarity used by these experts were evaluated and adopted where appropriate.

RATIONALE/SIGNIFICANCE OF FACTOR:
Certain rare species and their habitat are "protected" in provincial legislation under the 'Endangered Species Act'. Construction, operation and maintenance of facilities should not create off-site interference with species cited in legislation.

The occurrence of non-legislated and regionally rare species should also be identified so that site selection and design concepts consider potential constraints associated with these species. This factor contributes to attaining the goal of minimizing impact on the natural environment.

Rare species are often of special educational and scientific interest. Populations at the edge of a species' distribution range may contain a significant gene pool.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

INTERPRETATION/METHODOLOGY:
Rarity was determined by reference to key documents on plant and animal species status. The significance of rarity designations was evaluated on a species-by-species basis, e.g. regional vs. provincial and national designations. Discussions with experts augmented the document review process.

INDICATORS:
(1) Number of Rare Plant Species

DEFINITION: Simply the number of plant species, found in the site vicinity, which have been designated as rare.

RATIONALE/SIGNIFICANCE:
The number of rare species found is one indication of the environmental significance of a geographic unit. We have assumed that the more rare plant species encountered in a site vicinity, the higher the probability of creating an environmental impact. Large numbers of rare plant species may indicate the existence of significant habitats or biological associations which are potentially sensitive to off-site impacts associated with facility development and operation.

SOURCES OF INFORMATION:
The following potential sources of information are available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms

INPUTS FROM OTHER CONSULTANTS:
None

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- certain rare plant species occurrence may vary from year to year
- rare plant and animal species are separated for a number of reasons: differences in susceptibility to certain types of impact, differences in habitat requirements, differences in reliability of reported occurrences

INDICATORS:
(2) Number of Rare Animal Species

DEFINITION: Simply the number of animal species, found in the site vicinity, which have been designated as rare.

RATIONALE/SIGNIFICANCE:
The number of rare species found is one indication of the environmental significance of a geographic unit. We have assumed that the more rare animal species encountered in a site vicinity, the higher the probability of creating an environmental impact. Large numbers of rare animal species may indicate the existence of significant habitats or biological associations which are potentially sensitive to off-site impacts associated with facility development and operation.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

SOURCES OF INFORMATION:
The following sources of information are available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- rare animal species occurrence may vary from year to year
- rare plant and animal species are separated for a number of reasons: differences in susceptibility to certain types of impact, differences in habitat requirements, differences in reliability of reported occurrences.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
Significant Environmental Unit (SEU) is a term coined to refer collectively to a number of types of areas which contain special environmental attributes or which perform significant environmental functions. SEUs have been identified in existing reports.

Component types of SEUs include:

- Environmentally Significant (Sensitive) Areas - ESAs
- Areas of Natural and Scientific Interest - ANSIs
- Areas of Important Biological Resources - AIBRs

RATIONALE/SIGNIFICANCE OF FACTOR:
This factor relates to the objective of minimizing impact on the natural environment.

SEUs may:

- contain populations of rare or uncommon plants or animals
- perform significant environmental functions
- provide habitat for species which require extensive territories
- contain biological associations or communities which are poorly represented elsewhere
- maintain a significant warm water fishery which provides fishing opportunities
- serve as cold water fishery migratory routes

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE OF FACTOR: (cont'd)

- contain habitat for, or populations of, recreationally or economically important species, e.g. bait fish
- represent significant earth science features

SEU mapping indicates the location and geographic extent of areas known to possess significant environmental features and/or to perform significant environmental functions.

Knowledge of the area of SEUs in the site vicinity is of value in identifying potential off-site impacts of OWMC facilities. The relative potential for off-site impacts could be used in the comparative evaluation of facility options.

INTERPRETATION/METHODOLOGY:

The location and extent of SEUs within site vicinities is known from Phase 3B. These were mapped. The areal extent of SEUs was measured and was used as a broad indication of potential for impact.

More precise impact prediction cannot be completed at this time because details of facility components are not known and biological conditions in the SEUs have not been confirmed.

The present evaluation is comparative and seeks to identify major differences between potential for impact on biological conditions around each site.

SEUs represent areas where significant environmental conditions have been recorded in the past. Many SEUs represent areas with high potential for providing fish and wildlife habitat.

INDICATOR:

(1) Areal Extent of SEUs

DEFINITION: The area within the site vicinity which is covered by SEU.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE:
The areal extent of SEU in site vicinities provides a relative indication of the potential for off-site impact.

SOURCES OF INFORMATION:
- published SEU reports
- Phase 3B data
- discussions with agencies

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- Although field work for certain of the SEU studies was conducted up to nine years ago, and the status of species which justified designation in the past may have changed, we assume that habitat for significant species is still intact in the SEUs.
- It has been assumed that the entire SEU is potentially affected; it is also assumed that the potential for impact is directly proportional to areal extent of SEU.
- Most of the SEUs are not designated in approved official plans of Regional Municipalities
- Limitations in the scale or quality of mapping for certain AIBRs and ANSIs limited the accuracy with which certain SEU boundaries could be delineated

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

COMMENTS/ASSUMPTIONS/LIMITATIONS: (cont'd)

- Despite the limitations indicated above, consideration of SEUs during the comparative evaluation is important as these areas are known to contain significant environmental features and to be of concern to certain agencies.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:
Natural Environmental Impacts

APPLIED FACTOR:
Other natural vegetation

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
All other areas of natural vegetation, excluding SEUs. Forest, thicket, field and marsh vegetation types are included. "Natural" vegetation is defined as plant life which can thrive without sustained human management, in contrast to agricultural crops.

RATIONALE/SIGNIFICANCE OF FACTOR:
This factor represents the areal extent of natural vegetation within the site vicinity envelope. Natural vegetation, whether forest, old field or wetland, provides living space for a variety of plant and animal species. A number of as yet poorly defined, potential impacts may be associated with the OWMC facilities. Loss of trees due to changes in drainage patterns and soil moisture regimes on the site perimeter, is an example of a potential site vicinity impact.

The areal extent of natural vegetation within each site vicinity was measured and was used as an index of potential impact on the natural environment of each site vicinity.

INTERPRETATION/METHODOLOGY:
Natural vegetation units greater than 2 ha in area were identified and assigned a cover type. Forest Resource Inventory (FRI) maps were used as a data source. Recent (1984) air photos at a scale of 1:10,000 were used to verify FRI data, to update unit boundaries and to assign a cover type to units not addressed by FRI. Field truthing was not completed.

The areal extent of other natural vegetation was calculated by counting using a square grid and rounding to the nearest hectare.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Other natural vegetation

INDICATOR:
(1) Areal Extent Within Site Vicinity

DEFINITION: Area, rounded to nearest hectare, of natural vegetation between the site and site vicinity boundary.

RATIONALE/SIGNIFICANCE:
The area covered by natural vegetation provides a general approximation of the potential for impact on the natural environment.

For purposes of a relative comparison between the candidate sites, the areal extent of natural vegetation within the site vicinity envelope provides a broad indication of potential for impact on plant species and wildlife associated with natural vegetation.

SOURCES OF INFORMATION:
Forest Resource Inventory maps prepared by the Ministry of Natural Resources (1979) show woodlots and other treed areas. Air photos (1984) were used to check cover types and update boundaries. Vegetation types and unit boundaries were checked against maps prepared by the agricultural consultant, Ecologistics Limited.

INPUTS FROM OTHER CONSULTANTS:
Vegetation data were discussed with Ecologistics Limited.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Other natural vegetation

STUDY AREA:
Site vicinity. Area between site boundary and outer site vicinity boundary (approximately 2 km radius).

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- We have assumed that noise, lighting, fencing, drainage and traffic associated with OWMC facilities will have the potential for creating as yet undefined impacts on the natural environment of the site vicinity
- We have assumed that the potential for impact on site vicinity vegetation and wildlife populations not within SEUs is proportional to the areal extent of natural vegetation
- Special features and attributes, rare species, etc., are dealt with on other site vicinity factor sheets
- Designation of cover type for certain fields from the air photos was difficult and may change from year to year
- During Phase 4B there will be a need to define potential impact agents and the location of sensitive receptors; that is, a more detailed assessment of site vicinity impacts will be required

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR;**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

FACILITY COMPONENTS AFFECTED:
All facilities, site vicinity

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Siting Option Comparison

DEFINITION OF FACTOR:
These features represent habitat which is essential to key periods in the life history of certain fish and wildlife species. Examples of fish and wildlife features of significance include: heronries, deer wintering areas, significant fish spawning sites and waterfowl staging areas.

This factor addresses significant biological features other than those covered by the rare species factors and in areas other than those occupied by SEUs.

RATIONALE/SIGNIFICANCE OF FACTOR:
It was assumed that the potential exists for undefined off-site impacts on fish and wildlife resulting from the OWMC facility. Phase 4A research has indicated the presence of certain significant fish and wildlife features. These features represent habitat where concentrations of animals occur, for example, during the breeding season. The number of features can be used as a relative measure of the potential impact on each site vicinity.

INTERPRETATION/METHODOLOGY:
Locations of significant fish and wildlife features, which did not overlap with SEUs, were mapped. The number of significant features in each site vicinity was tabulated.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

INDICATOR:
(1) Number of significant features

DEFINITION: A count of significant fish and wildlife features in each site vicinity.

RATIONALE/SIGNIFICANCE:
These features represent significant resources which might be affected by facility development. The number of features provides a relative measure of the potential impact on each site vicinity.

SOURCES OF INFORMATION:
- agencies
- existing reports
- citizens' groups
- special interest groups
- "walk-and-talk" data

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Site vicinity.

COMMENTS/ASSUMPTIONS/LIMITATIONS:
- It is assumed that there is some as yet unknown potential for creating impact, associated with the OWMC facilities. These impacts would involve fish and wildlife features

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

COMMENTS/ASSUMPTIONS/LIMITATIONS: (cont'd)

- It is assumed that all features within the site vicinity would be affected and that the number of features is a measure of potential impact
- Significant fish and wildlife features considered here tend to be discrete locations or features; thus, the number of features is a more suitable indicator than is area covered by these features

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

FACILITY COMPONENTS AFFECTED:
All facilities

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Rail access

DEFINITION OF FACTOR:
Significant Environmental Unit (SEU) is a term coined to refer collectively to a number of types of areas which contain special environmental attributes or which perform significant environmental functions. SEUs have been identified in existing reports.

Component types of SEUs include:

- Environmentally Significant (Sensitive) Areas - ESAs
- Areas of Natural and Scientific Interest - ANSIs
- Areas of Important Biological Resources - AIBRs

RATIONALE/SIGNIFICANCE:
This factor related to the objective of minimizing impact on the natural environment.

SEUs may:

- contain populations of rare or uncommon plants or animals
- perform significant environmental functions
- provide habitat for species which require extensive territories
- contain biological associations or communities which are poorly represented elsewhere
- maintain a significant warm water fishery which provides fishing opportunities
- serve as cold water fishery migratory routes
- contain habitat for, or populations of, recreationally or economically important species, e.g. bait fish
- represent significant earth science features

Note: all rail and road factors are "applied" factors.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE:
SEU mapping indicates the location and geographic extent of areas known to possess significant environmental features and/or to perform significant environmental functions. Recognition of these units during comparison of rail options will assist in avoiding and minimizing impacts on known significant environmental resources.

SOURCES OF INFORMATION:
Reports which identify SEUs in drainage basins and Regional Municipalities located within the Candidate Areas were utilized. Only regional overview studies and types of analyses which were applied in all Candidate Areas were accessed. Environmental feature data contained in local planning documents such as a city's official plan were not used since the approach to and scope of identification of significant environmental features and designation assigned may vary from plan to plan.

Sources used included reports prepared by or for Conservation Authorities and Regional Municipalities, Ministry of Natural Resources' Areas of Natural and Scientific Interest files, District Land Use Guidelines, a fish migration route map and discussions with Conservation Authority, Municipality and Ministry of Natural Resources District, Regional and Head Office staff. The presence of Carolinian plant species was the reason for designating many environmentally significant areas, particularly in the Niagara Region.

For those sections of rail alignment within the site boundary, field observations provide an additional information source. "Walk-and-Talk" interview data also cover portions of certain properties which contain rail options passing through SEUs.

INPUTS FROM OTHER CONSULTANTS:
None.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Significant Environmental Units (SEUs)

INTERPRETATION/METHODOLOGY:

The location and geographic extent of areas containing significant environmental features were mapped. Where boundaries of units overlapped or were contiguous they were combined and an amalgamated SEU was mapped.

All SEUs mapped represent features or functions of significance. No interpretation was made to determine relative significance among the various SEUs.

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Although field work for certain of the SEU studies was conducted nine or more years ago, and the status of species which justified designation in the past may have changed, habitat for significant species is still intact in the SEUs.
- Most of the SEUs are not designated as such in approved official plans of Regional Municipalities.
- Limitations in the scale or quality of mapping for certain AIBRs and ANSIs limited the accuracy with which certain SEU boundaries could be delineated.
- Despite the limitations indicated above, consideration of SEUs during the comparison of rail options is important, as these areas are known to contain significant environmental features and to be of concern to certain agencies.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Non-SEU Woodlots >20 ha in Size

FACILITY COMPONENTS AFFECTED:
All facilities.

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Rail access

DEFINITION OF FACTOR:
Wooded areas which are not Significant Environmental Units but which are greater than 20 ha in area. Most of these areas are not designated in regional official plans.

RATIONALE/SIGNIFICANCE:
This factor documents the presence of a vegetated unit which may have value as a forestry or recreational resource or may provide wildlife habitat. This factor flags areas which may have potential for significance but may not have been studied during ESA or other inventories.

SOURCES OF INFORMATION:
Primarily identified by interpretation of aerial photographs and reference to 1:50,000 scale topographic maps. The significance and use of these woodlots on site and in the site vicinity were determined through discussions with landowners and government officials. Field work provided additional information on woodlots >20 ha in area which are on sites near rail alignments.

INPUTS FROM OTHER CONSULTANTS:
None

INTERPRETATION/METHODOLOGY:
Boundaries of woodlots were verified by checking those on the topographic map sheets against recent air photos. Only treed units were mapped.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Non-SEU Woodlots >20 ha in Size

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Woodlots greater than 20 ha in size are assumed to have potential value as forest wildlife habitat.
- Although it is assumed that these woodlots are relatively less significant than are SEUs, certain of these woodlots may contain resources which would qualify them as ESAs.
- Little or no information is available on most of these woodlots in the site vicinity.
- Size of these woodlots alone is not necessarily indicative of the relative significance of each woodlot for wildlife. Rather, adjacent land use, woodlot size, shape and location relative to watercourses and other woodlots would influence the significance of these woodlots for wildlife.
- The location of woodlot boundaries in the site vicinity must be assumed to be approximate, as vegetation succession, wood cutting and land development may have altered woodlot edges.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

FACILITY COMPONENTS AFFECTED:
All facilities

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Rail access

DEFINITION OF FACTOR:
These features represent habitat which is essential to key periods in the life history of certain fish and wildlife species and include locations of rare species occurrence. Examples of fish and wildlife features of significance include: heronries, deer wintering areas, significant fish spawning sites, waterfowl staging areas and rare species locations. Rare species have populations of limited size and distribution. This factor addresses feature occurrences which were not covered within the SEU assessment.

RATIONALE/SIGNIFICANCE:
In the interests of avoiding impacts on the natural environment, significant biological features were identified within and adjacent to rail option corridors. Natural environment features were considered during rail option comparison since zoological features of significance may be eliminated or fragmented by construction of rail facilities.

Rail options were compared on the basis of a number of biological factors including fish and wildlife features of significance.

SOURCES OF INFORMATION:
Agencies and the public, especially local experts and special interest groups, were important data sources. A review of reports and literature was also completed to determine where significant fish and wildlife resources and rare species

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

SOURCES OF INFORMATION: (cont'd)
occurred along each rail access route. Field checks provided data on special features present along rail options passing through the sites.

INPUTS FROM OTHER CONSULTANTS:
None.

INTERPRETATION/METHODOLOGY:
Locations of significant fish and wildlife features and rare species occurrences were mapped at a 1:10,000 scale. Characteristics of features which were in the path of rail corridors or which were immediately adjacent to rail corridors were summarized in a matrix.

Potential impacts on significant fish and wildlife features were evaluated along with considerations of other biology factors to develop an overall assessment of impacts on biological resources associated with each rail option.

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Occurrences of rare species within the site vicinity are poorly documented. In the case of one LF-9C rail option, the study area extends beyond the site vicinity envelope; only Phase 3B data are available for this portion of the study area. Phase 3B data only documented rare species within SEUs.
- No field checks of significant feature or rare species occurrences outside the site boundary were completed.
- Occurrences of significant habitats and rare species outside of SEUs are an important rail option comparison consideration.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Fish and Wildlife Features of Significance

COMMENTS/ASSUMPTIONS/LIMITATIONS: (cont'd)

- Because SEUs have been identified in published reports and certain agencies have policies and guidelines regarding them, we have identified SEUs as the most important rail option factor. Significant fish and wildlife features and rare species occurrences are next in order of importance. The significance of combinations of factor occurrences were evaluated on an individual basis, in instances where this situation arose.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Natural Environmental Impacts	Rare Species

FACILITY COMPONENTS AFFECTED:
All facilities

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Rail access

DEFINITION OF FACTOR:
Plant and animal species which have populations of limited size and distribution are considered rare. Rarity is often assigned on a geographic basis, e.g. national, provincial and regional. "Rare" is used here in a broad sense and covers such designations as endangered, threatened, and regionally, provincially or nationally rare.

Rarity was determined by a review of published documents and by discussions with experts who have a knowledge of the status of rare species. The definitions of rarity used by these experts were evaluated and adopted where appropriate.

RATIONALE/SIGNIFICANCE OF FACTOR:
Certain rare species and their habitats are "protected" in provincial legislation under the 'Endangered Species Act'. Construction, operation and maintenance of facilities should not interfere with species cited in legislation.

The occurrence of non-legislated and regionally rare species should also be identified so that site selection and design concepts consider potential constraints associated with these species. This factor contributes to attaining the goal of minimizing impact on the natural environment.

Rare species are often of special educational and scientific interest. Populations at the edge of a species' distribution range may contain a significant gene pool.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR:**
Natural Environmental Impacts	Rare Species

INTERPRETATION/METHODOLOGY:
Rarity was determined by reference to key documents on plant and animal species status. The significance of rarity designations was evaluated on a species-by-species basis, e.g. regional vs. provincial and national designations. Discussions with experts augmented the document review process. To the extent that the data base allowed, locations, numbers and condition of rare species populations were evaluated.

Opinions of local experts on past status changes in species were an additional element in evaluation and interpretation.

INDICATORS:
(1) Number of rare species

DEFINITION: Number of plant and animal species which meet the broad definition "rare".

RATIONALE/SIGNIFICANCE:
The number of rare species reported is one indication of the environmental significance of a study area. We have assumed that the more rare species one encounters in a relatively small area (OWMC study sites), the more difficult it may become to locate constraint-free lands and the higher the probability of creating an environmental impact. Large numbers of rare species may indicate the existence of significant habitats or biological associations which are also potential constraints to facility development.

SOURCES OF INFORMATION:
The following sources of information were available:

- published reports on species status and distribution
- agency contact
- public interest group contact
- interview forms
- field work

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**APPLIED FACTOR**
Natural Environmental Impacts	Rare Species

INPUTS FROM OTHER CONSULTANTS:
None

STUDY AREA:
Rail Option

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- site-specific knowledge of rare species may be incomplete or outdated
- rarity status of certain species may be under review or poorly known
- detailed field work (Phase 4B) will be required before a sound knowledge of species status is achieved
- certain rare species occurrence may vary from year to year

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

FACILITY COMPONENTS AFFECTED:
Access roads

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Access Roads - Comparison of Siting Options

DEFINITION OF FACTOR:
This factor considers the potential impact on fish communities that may occur as a result of a spill involving vehicles transporting hazardous wastes and reagents along an access corridor to a waste treatment facility and the possible movement of contaminants to surface waters.

RATIONALE/SIGNIFICANCE OF FACTOR:
There is a possibility of an accidental release of hazardous wastes during transit. Surface waters provide a pathway for the rapid movement of contaminants from the spill site.

This factor recognizes that there is potential for impact on downstream fish populations in the event of an accidental spill of toxic waste along an access road. Two types of indicators contributed to this factor: (1) a spill pathway index which addresses the fact that the potential of a spill entering a stream varies among routes, and (2) length of significant fishery downstream of watercourses crossed or adjacent to access roads which recognizes that not all streams exhibit the same sensitivity from a fisheries perspective.

INTERPRETATION/METHODOLOGY:
The surface water study team determined the proportion of each access road for which there was a high potential of a waste spill entering a stream. This information was combined with waste transport data to yield a spill pathway index (SPI). The SPI was used as an indicator of the transportation impact potential on fish communities factor.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

INTERPRETATION/METHODOLOGY: (cont'd)
The biology element of the analysis related to the significance of fish populations in streams receiving spills. Two additional indicators were developed: (1) downstream length of regionally significant fishery, and (2) downstream length of locally significant fishery.

The method used to determine proportion of access road at risk is as follows. Streams that flow adjacent to or cross access routes were identified on 1:25,000 scale topographic maps.

The length of access road having a high potential of waste entry to a stream in case of a transportation accident was considered to consist of two components. The first was the floodplain (top-of-bank) and was measured directly from 1:25,000 scale topographic maps. The second component was the slightly sloping land adjacent to the floodplain. This length was calculated by means of standard engineering methods that used information available from 1:25,000 scale topographic maps (e.g. slope) and published sources (e.g. overland flow velocity).

Other elements of methods associated with the spill pathway index are described as part of the definition of the indicator.

Existing fisheries data were mapped and tabulated for streams along access roads. Reaches downstream of access roads were assigned to one of four fisheries significance categories: regionally significant, locally significant, insignificant and no data. Only the lengths of regionally and locally significant fisheries were used in comparing access roads.

During the Phase 4A comparative evaluation, only the downstream length of significant fisheries indicator values were used to compare access route options.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

INTERPRETATION/METHODOLOGY: (cont'd)
All three indicators were used in the detailed comparative evaluation of siting options, in which the access routes preferred by the site selection team were combined with other facility components into a facility siting option.

INDICATOR:
(1) Spill Pathway Index (SPI)

DEFINITION: The spill pathway index is a composite numerical index related to the expected rate of in-transit spill events by OWMC vehicles (through an accidental or other loss of containment), the type of commodity carried (waste, reagents and additives or inter-site transfer material), and the proportion of an access road where there is a high potential of spilled waste entering a stream. The larger the index number, the higher the potential for impact.

RATIONALE/SIGNIFICANCE:
The likelihood of a contaminant being released to the environment along the access roads is directly related to the frequency of "losses of containment" of an OWMC vehicle. The index acknowledges the different types of commodities carried by OWMC vehicles. The potential for contaminant movement to a watercourse in the event of a spill is directly related to the Stream Crossing Distance. Stream Crossing Distance is expressed as a proportion of each link length, to account for the proportion of access roads where there is a high risk of contaminant movement to a stream. This index was developed with the M.M. Dillon Transportation Consultant.

SOURCES OF INFORMATION:
- 1:25,000 scale topographical mapping

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

INPUTS FROM OTHER CONSULTANTS:
Access route locations from Site Selection Team.
MMD-Transportation undertook calculations of SPI with inputs from GLAL - Surface water.

STUDY AREA:
Access roads

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Small drainage ditches and swales are not included in the analysis at this study stage.
- It is assumed that wastes being transported are in a liquid state and of low viscosity.
- It is assumed that a spill event involving an OWMC vehicle occurring within a stream crossing segment of an access route will result in waste entering a stream/river before emergency response crews can mitigate the spillage.
- Not all accidents result in a "loss of containment" and hence a spillage.

INDICATOR:
(2) Downstream Length of Regionally Significant Fisheries

DEFINITION: There are two elements to the indicator: (a) stream length, and (b) regionally significant fishery. Stream length refers to the sum of stream reaches, at high risk of receiving spilled waste, located downstream of access roads. These reaches support regionally significant fisheries. Regionally significant fisheries include areas supporting resident and migrating salmonid populations, and rare, threatened or endangered fish species.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: **GARTNER LEE ASSOCIATES LIMITED (GLAL)**

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

RATIONALE/SIGNIFICANCE:
The downstream length of watercourse at high risk provides an indication of the area which could be affected by a spill. The length of stream provides one measure which can be used to compare access route options.

The significance of the resource affected by the spill is another comparative tool. Regionally significant fisheries were identified as the most significant type of fish community which might be affected by a waste spill.

SOURCES OF INFORMATION:
Regionally significant fisheries were determined by assessing data from a number of sources:

- published literature
- agency reports and data e.g. OMNR Aquatic Habitat Inventory
- local citizens
- bait fishermen
- topographic maps
- aerial photos

Lengths of regionally significant fisheries were measured from 1:25,000 and 1:50,000 scale working maps.

INPUTS FROM OTHER CONSULTANTS:
Access route locations from site selection team. Identification of streams at high risk by GLAL surface water team.

STUDY AREA:
Access Roads

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Assumptions as outlined for the Spill Pathway Index apply
- Some interpolation of fish community type between sample stations was required
- Boundaries between fish community types may change through time

INDICATOR:

(3) Downstream Length of Locally Significant Fisheries

DEFINITION: There are two elements to the indicator: (a) stream length, and (b) locally significant fishery. Stream length refers to the sum of stream reaches, at high risk of receiving spilled waste, located downstream of access roads. These reaches support locally significant fisheries. Locally significant fisheries include areas supporting warm water fish populations, migratory sport fish other than salmonids, and bait fish populations which have been harvested recently.

RATIONALE/SIGNIFICANCE:

The downstream length of watercourse at high risk provides an indication of the area which could be affected by a spill. The length of stream provides one measure which can be used to compare access route options.

The significance of the resource affected by the spill is another comparative tool. Locally significant fisheries were identified as being of secondary significance relative to regionally significant communities.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Transportation Impact on Fish Communities

SOURCES OF INFORMATION:
Locally significant fisheries were identified by assessing data from a number of sources:

- published literature
- agency reports and data e.g. OMNR Aquatic Habitat Inventory
- local citizens
- bait fishermen
- topographic maps
- aerial photos

Lengths of locally significant fisheries were measured from 1:25,000 and 1:50,000 scale working maps.

INPUTS FROM OTHER CONSULTANTS:
Access route locations from Site Selection Team. Identification of streams at high risk by GLAL Surface Water Team.

STUDY AREA:
Access roads

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Assumptions as outlined for the Spill Pathway Index apply.
- Some interpolation of fish community type between sample stations was required.
- Boundaries between fish community types may change through time.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Significant Environmental Units (SEUs)

FACILITY COMPONENTS AFFECTED:
Locations proposed for access road improvements.

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Access roads

DEFINITION OF FACTOR:
Significant Environmental Unit (SEU) is a term coined to refer collectively to a number of types of areas which contain special environmental attributes or which perform significant environmental functions. SEUs have been identified in existing reports.

Component types of SEUs include:
- Environmentally Significant (Sensitive) Areas - ESAs
- Areas of Natural and Scientific Interest - ANSIs
- Areas of Important Biological Resources - AIBRs

RATIONALE/SIGNIFICANCE:
This factor related to the objective of minimizing impact on the natural environment.

SEUs may:
- contain populations of rare or uncommon plants or animals
- perform significant environmental functions
- provide habitat for species which require extensive territories
- contain biological associations or communities which are poorly represented elsewhere
- maintain a significant warm water fishery which provides fishing opportunities
- serve as cold water fishery migratory routes
- contain habitat for, or populations of, recreationally or economically important species e.g. bait fish
- represent significant earth science features

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Significant Environmental Units (SEUs)

RATIONALE/SIGNIFICANCE: (cont'd)
SEU mapping indicates the location and geographic extent of areas known to possess significant environmental features and/or to perform significant environmental functions. Recognition of these units during assessment of access routes will assist in avoiding and minimizing impacts on known significant environmental resources.

SOURCES OF INFORMATION:
Reports which identify SEUs in drainage basins and Regional Municipalities located within the Candidate Areas were utilized. Only regional overview studies and types of analyses which were applied in all Candidate Areas were accessed. Environmental feature data contained in local planning documents such as a city's official plan were not used since the approach to and scope of identification of significant environmental features and designation assigned may vary from plan to plan.

Sources used included reports prepared by or for Conservation Authorities and Regional Municipalities, Ministry of Natural Resources' Areas of Natural and Scientific Interest files, District Land Use Guidelines, a fish migration route map and discussions with Conservation Authority, Municipality and Ministry of Natural Resources District and Regional and Head Office staff. The presence of Carolinian plant species was the reason for designating many environmentally significant areas, particularly in the Niagara Region.

INPUTS FROM OTHER CONSULTANTS:
Locations of areas requiring road improvement, from MMD-Transportation.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Significant Environmental Units (SEUs)

INTERPRETATION/METHODOLOGY:

The location and geographic extent of areas containing significant environmental features were mapped. Where boundaries of units overlapped or were contiguous, they were combined and an amalgamated SEU was mapped.

All SEUs mapped represent features or functions of significance. No interpretation was made to determine relative significance among the various SEUs.

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Although field work for certain of the SEU studies was conducted nine or more years ago, and the status of species which justified designation in the past may have changed, habitat for significant species is still intact in the SEUs.
- Most of the SEUs are not designated as such in approved official plans of Regional Municipalities.
- Limitations in the scale or quality of mapping for certain AIBRs and ANSIs limited the accuracy with which certain SEU boundaries could be delineated.
- Despite the limitations indicated above, consideration of SEUs during the assessment of access routes is important, as these areas are known to contain significant environmental features and to be of concern to certain agencies.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Non-SEU Woodlots Greater than 20 ha in Size

FACILITY COMPONENTS AFFECTED:
Locations proposed for access road improvements.

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Access roads

DEFINITION OF FACTOR:
Wooded areas which are not Significant Environmental Units but which are greater than 20 ha in area. Most of these areas are not designated in regional official plans.

RATIONALE/SIGNIFICANCE:
This factor documents the presence of a vegetated unit which may have value as a forestry or recreational resource or may provide wildlife habitat. This factor flags areas which may have potential for significance but may not have been studied during ESA or other inventories.

SOURCES OF INFORMATION:
Primarily identified by interpretation of aerial photographs and reference to 1:50,000 scale topographic maps. The significance and use of these woodlots on-site and in the site vicinity was determined through discussions with landowners and government officials.

INPUTS FROM OTHER CONSULTANTS:
Locations of areas requiring road improvement, from MMD-Transportation.

INTERPRETATION/METHODOLOGY:
Boundaries of woodlots were verified by checking those on the topographic sheets against recent air photos. Only treed units were mapped.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: **GARTNER LEE ASSOCIATES LIMITED (GLAL)**

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Non-SEU Woodlots Greater than 20 ha in Size

COMMENTS/ASSUMPTIONS/LIMITATIONS:

- Although it is assumed that these woodlots are relatively less significant than are SEUs, certain of these woodlots may contain resources which would qualify them as ESAs.
- Little or no information is available on most of these woodlots in the site vicinity.
- Size of these woodlots alone is not necessarily indicative of the relative significance of each woodlot for wildlife. Rather, adjacent land use, woodlot size, shape and location relative to watercourses and other woodlots would influence the significance of these woodlots for wildlife.
- The location of woodlot boundaries in the site vicinity must be assumed to be approximate as vegetation succession, wood cutting and land development may have altered woodlot edges.

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Fish and Wildlife Features of Significance

FACILITY COMPONENTS AFFECTED:
Locations proposed for access road improvements.

FACTOR APPLIED FOR FOLLOWING OPTIONS:
Access roads

DEFINITION OF FACTOR:
These features represent habitat which is essential to key periods in the life history of certain fish and wildlife species and include locations of rare species occurrence. Examples of fish and wildlife features of significance include: heronries, deer wintering areas, significant fish spawning sites, waterfowl staging areas and rare species locations. Rare species have populations of limited size and distribution. This factor addresses feature occurrences which were not covered within the SEU assessment.

RATIONALE/SIGNIFICANCE:
To achieve the goal of minimizing environmental impact, significant fish and wildlife features were identified within corridors where road improvements are anticipated.

SOURCES OF INFORMATION:
Agencies and the public, especially local experts and special interest groups, were important data sources. A review of reports and literature was also completed.

INPUTS FROM OTHER CONSULTANTS:
Locations of areas requiring road improvement, from MMD-Transportation

OWMC PHASE 4A - FACTORS FOR SITE SELECTION

LEAD CONSULTANT: GARTNER LEE ASSOCIATES LIMITED (GLAL)

FACTOR GROUPING:	**FACTOR:**
Transportation Impact	Fish and Wildlife Features of Significance

INTERPRETATION/METHODOLOGY:
Locations of significant fish and wildlife features, including rare species, were determined as part of the Phase 4A data base. Maps showing rights-of-way potentially affected by road improvements were provided by M.M. Dillon-Transportation. Factor occurrences within the right-of-way were determined. Since there were no factor occurrences, this and the other two road improvement-environmental factors were screened out.

COMMENTS/ASSUMPTIONS/LIMITATONS:

- Locations of rare species occurrences are poorly documented outside of the site study area
- No field checks were completed outside the site study area

APPENDIX B

GLOSSARY OF TERMS

GLOSSARY OF TERMS

BOUNDARY REFINEMENT - the process of redefining site boundaries for certain candidate sites which were larger than required to meet the minimum site life requirement. Candidate sites PI-1N, LF-3C AND LF-1E underwent boundary refinement.

FACILITY CHARACTERISTICS - are descriptions of key elements of the proposed undertaking.

FACTOR - a positive or negative consideration which assists in comparing siting options. Biology factors dealt with impact considerations.

FACTOR RANK - This is the relative weight or level of importance attached to a factor in comparison with other factors for the same study area.

FACTOR SUITABILITY LEVEL - is the relative level of constraint associated with a factor occurrence within a particular study area.

FISHERY CONSTRAINT SCALE - a means of comparing the relative level of potential impact associated with stream crossings along access routes. Constraint was expressed as high, medium or low for lengths of regionally and locally significant fishery.

INDICATOR - elements which contribute to analysis of factors. Indicators are more precise means of identifying, describing and predicting impact than factors are.

INDICATOR AGGREGATION - a process of amalgamating indicator data so that an overall factor constraint level can be determined. It was accomplished by combining measures of potential impact with weights which reflect the relative importance of indicators.

SCALING - the conversion of data to units of desirability, such as high, medium or low.

SCREENING - a review process designed to identify indicators for which there are no data values, no differences among options, insignificant impacts or duplication of issues.

SITING OPTION - the combination of study areas and facilities which together constitute the OWMC undertaking, e.g. the candidate site or sites and ancillary components such as access roads.

SPILL PATHWAY INDEX - a composite numerical index related to the expected rate of in-transit spill events by OWMC vehicles, the type of commodity carried, and the proportion of an access road where there is high potential for a waste spill entering a stream. This index was one indicator in the access route analysis.

APPENDIX C

BASE MAPS SHOWING REFINED BOUNDARIES,
ACCESS ROAD OPTIONS AND RAIL ACCESS OPTIONS

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C19	- RAIL ACCESS - PI-27E	C-19
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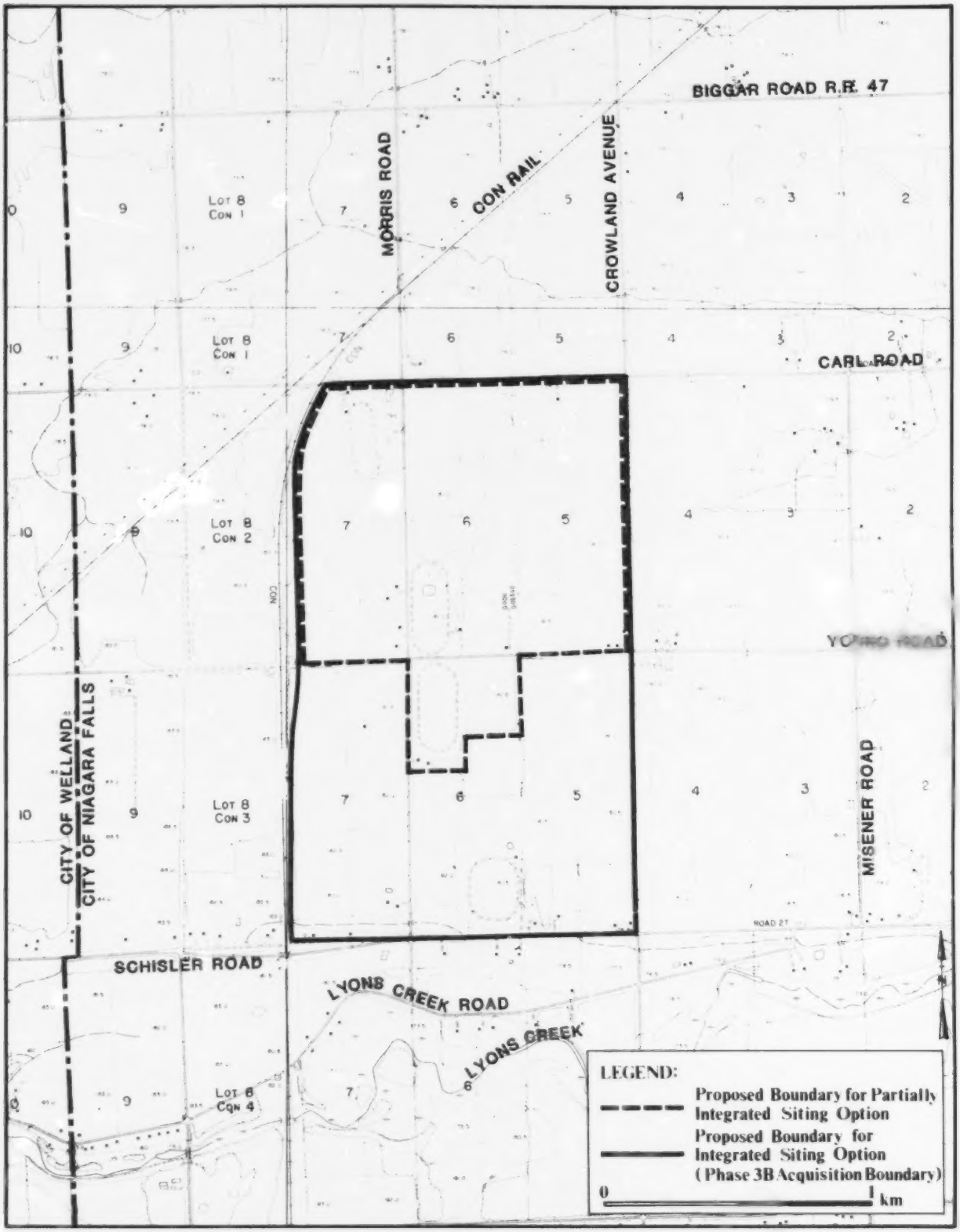
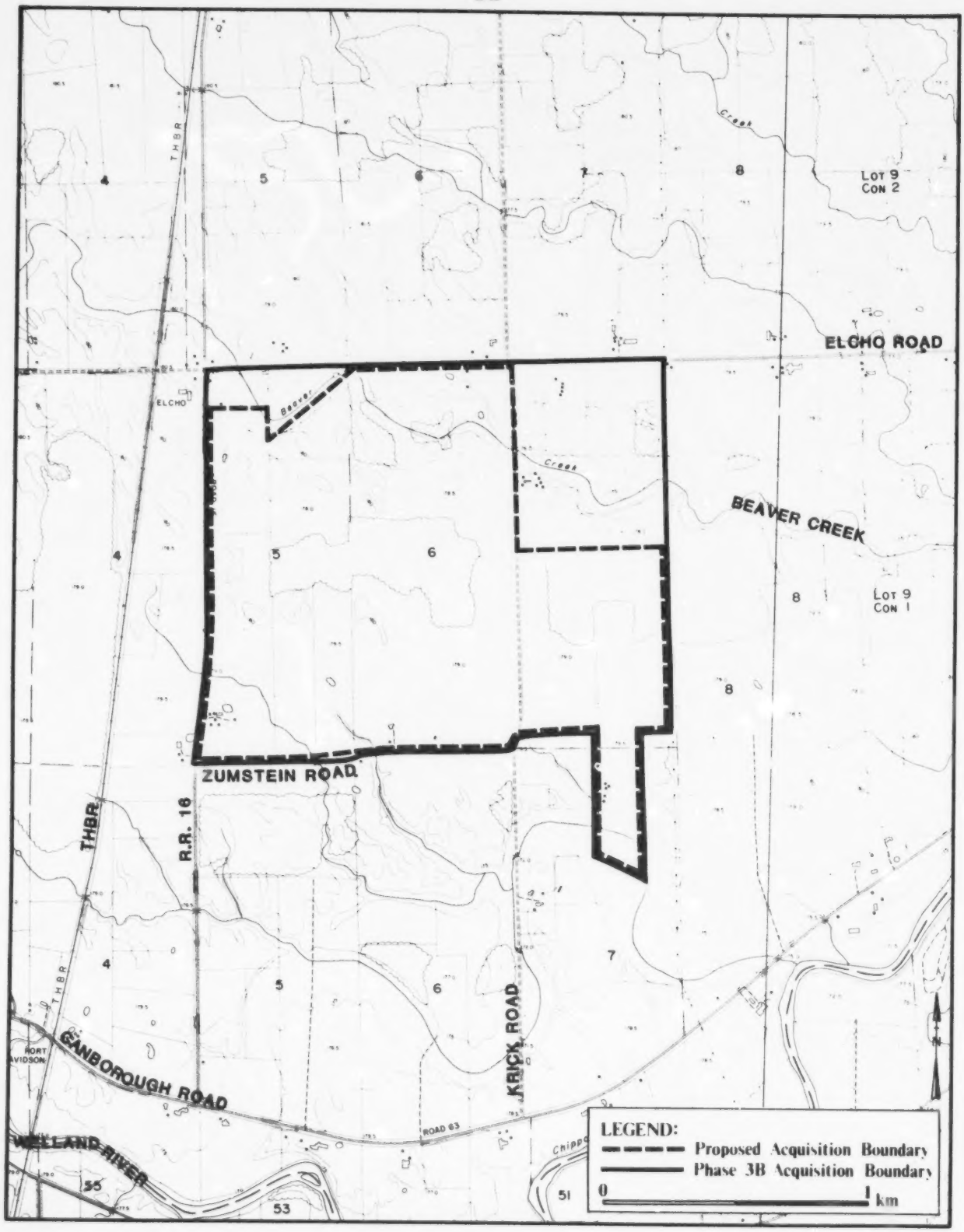


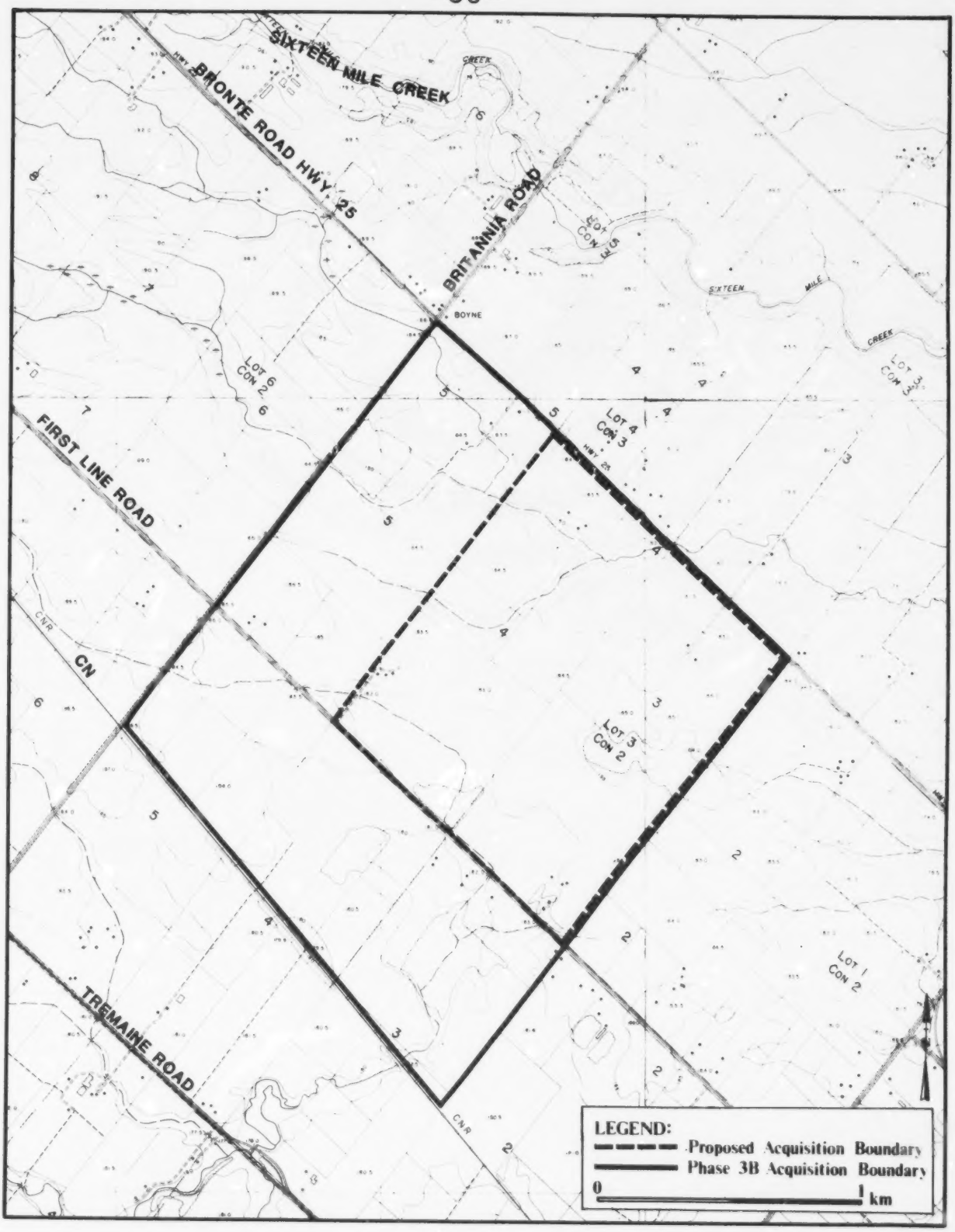
LF-1E

REFINEMENT OF SITE BOUNDARIES

FIGURE C1



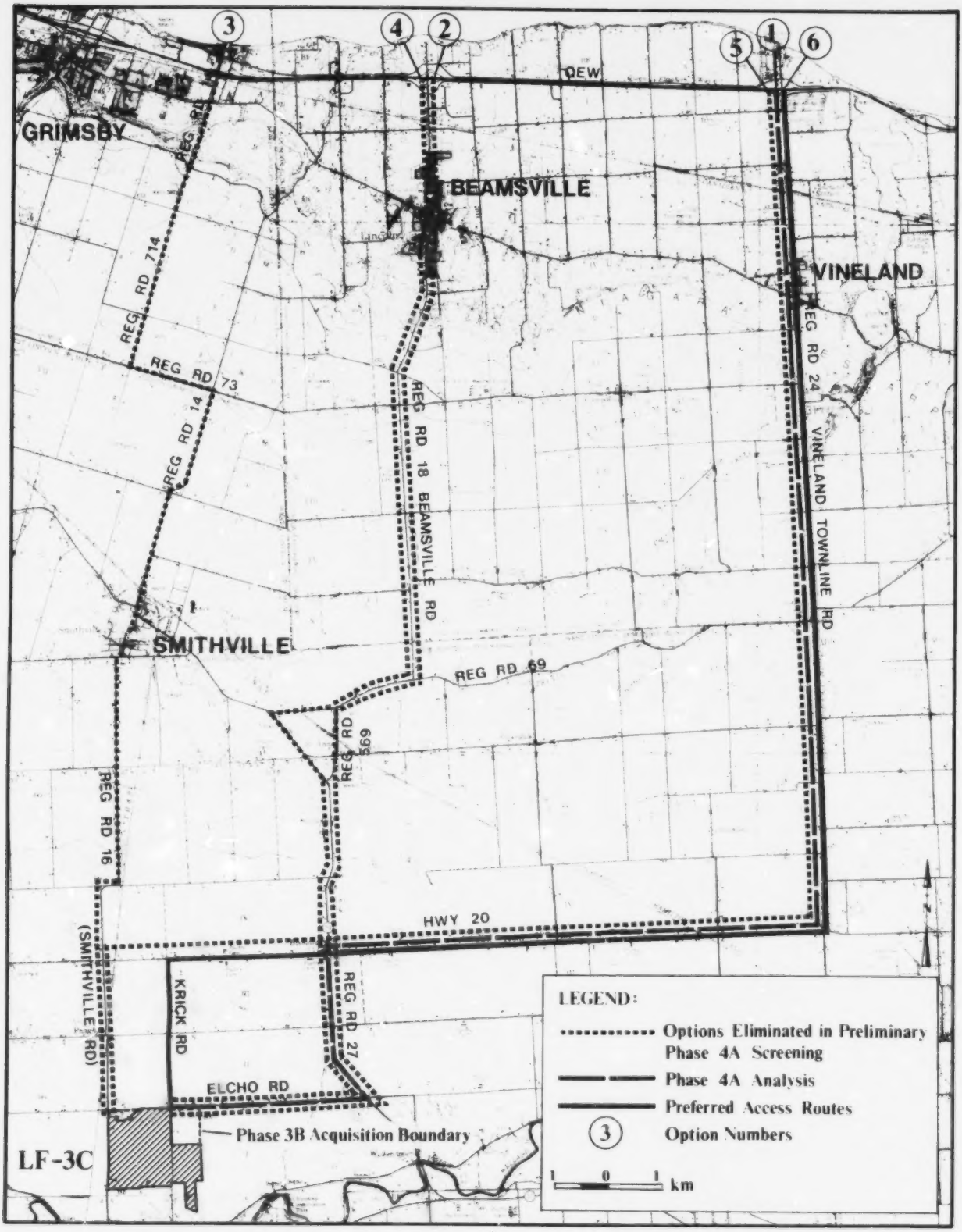
LF-3C
REFINEMENT OF SITE BOUNDARIES
FIGURE C 2



PI-1N

REFINEMENT OF SITE BOUNDARIES

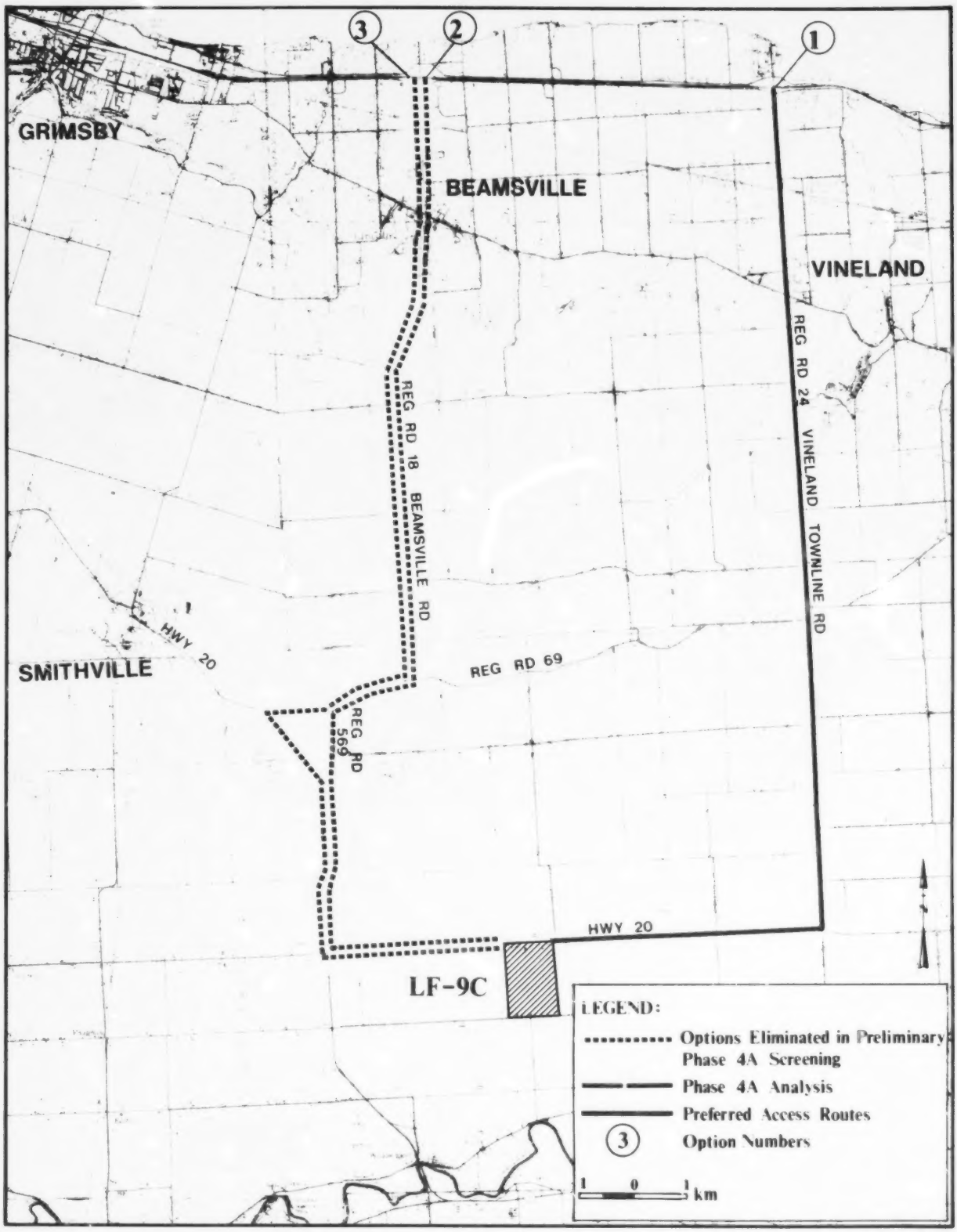
FIGURE C3



LF - 3C

PHASE 4A ACCESS ROADS

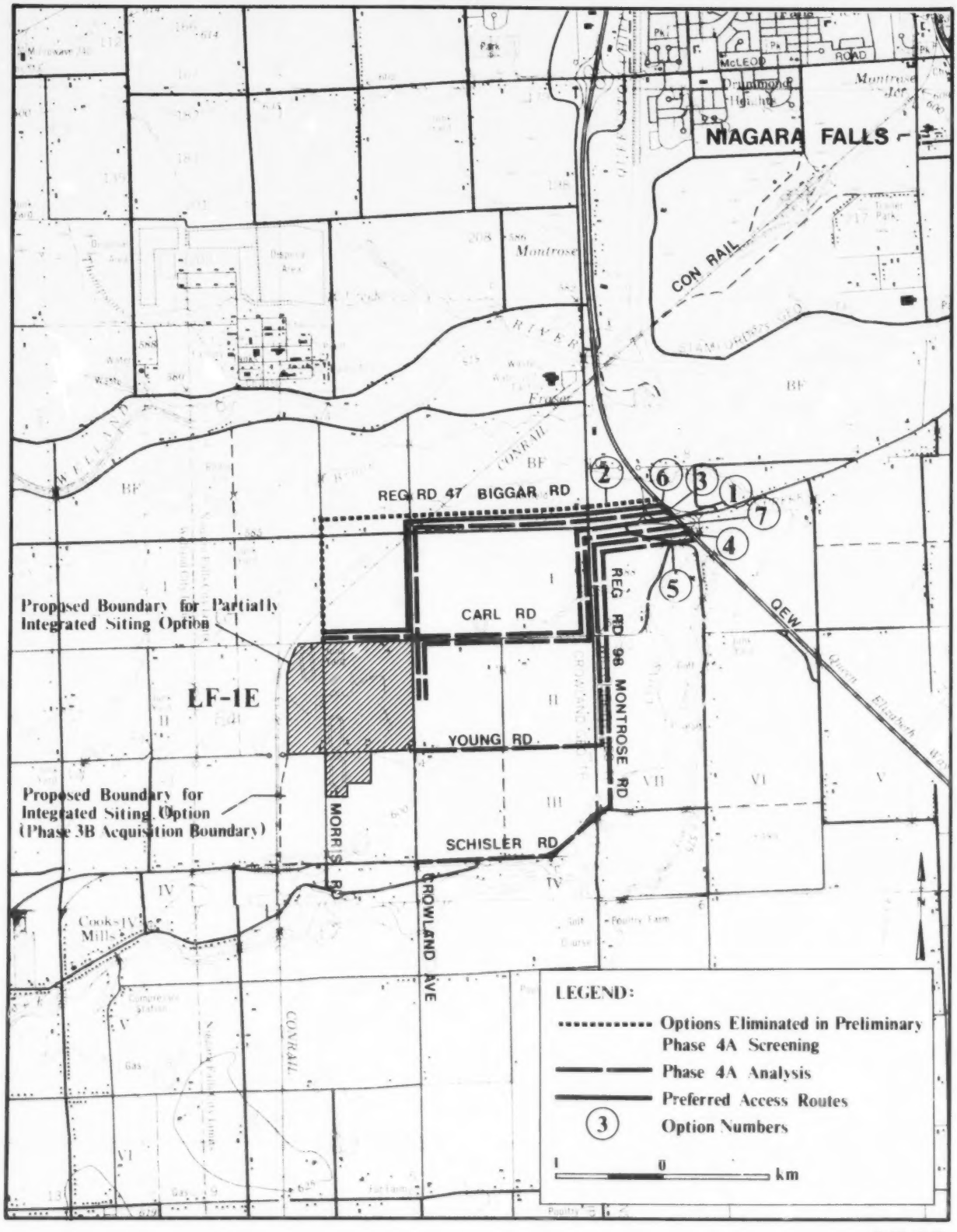
FIGURE C 4



LF-9C

PHASE 4A ACCESS ROADS

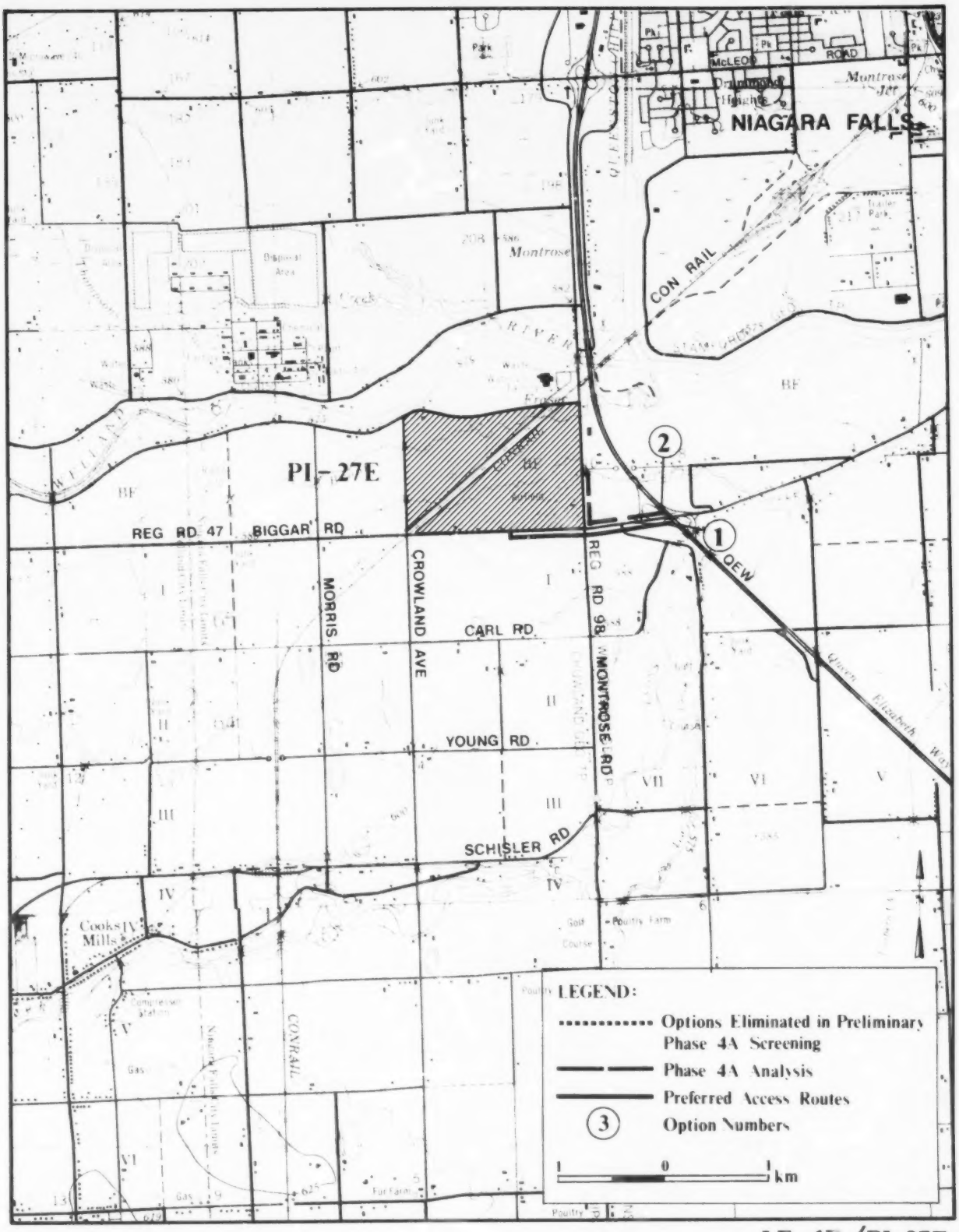
FIGURE C5



LF-1E

PHASE 4A ACCESS ROADS

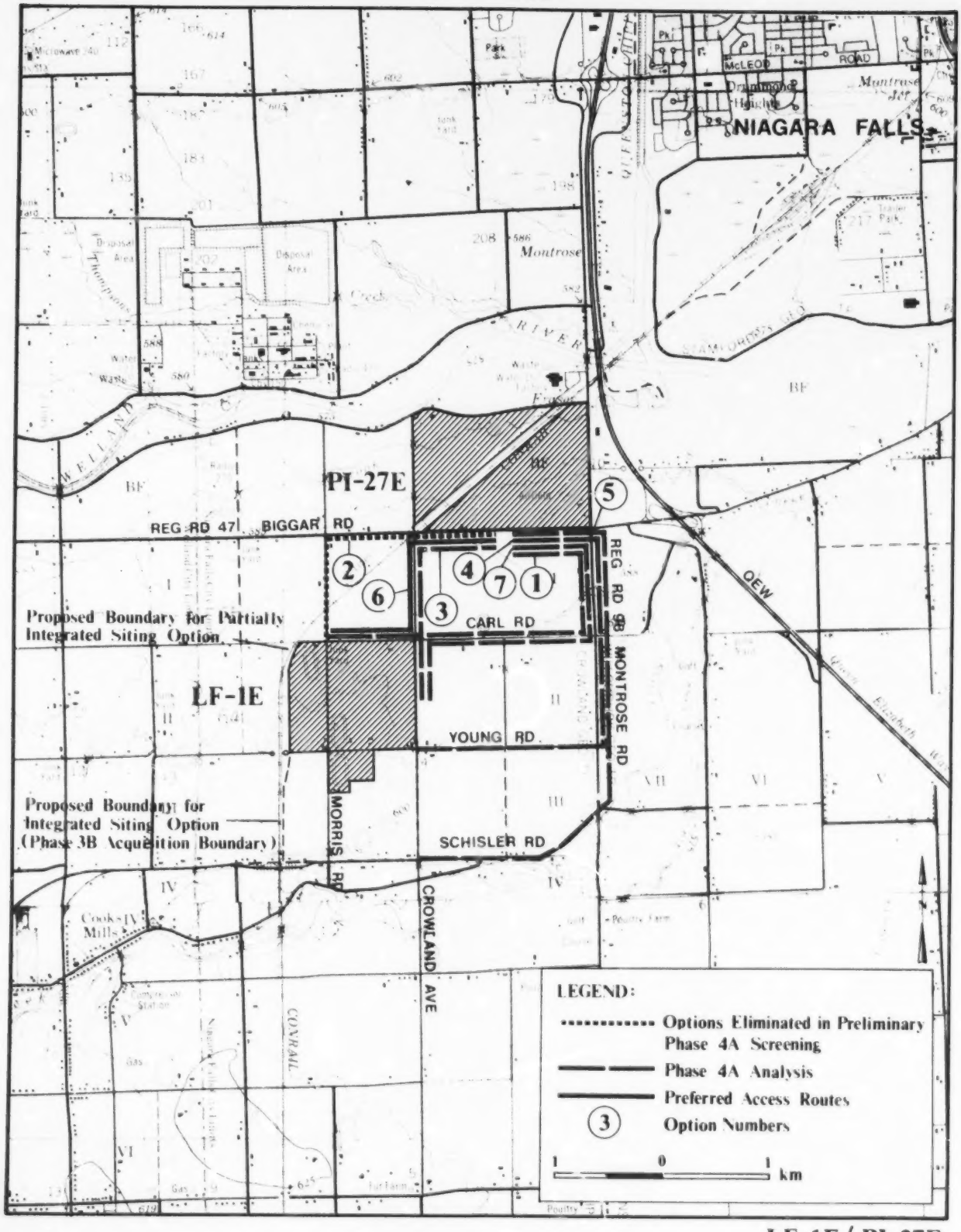
FIGURE C6



LF-1E /PI-27E
TO PI-27E

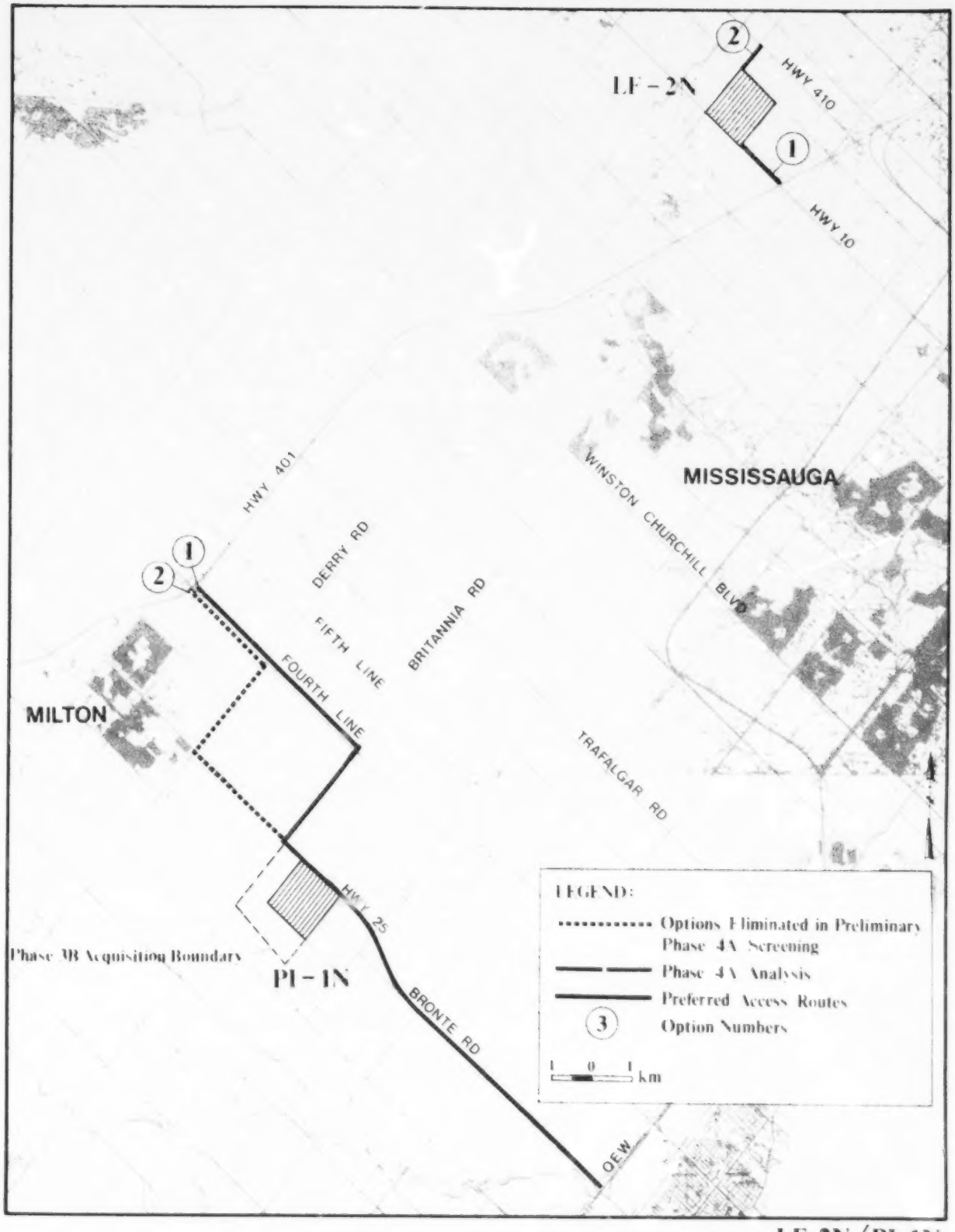
PHASE 4A ACCESS ROADS

FIGURE C7



LF-1E/ PI-27E
PI-27E TO LF-1E
PHASE 4A ACCESS ROADS

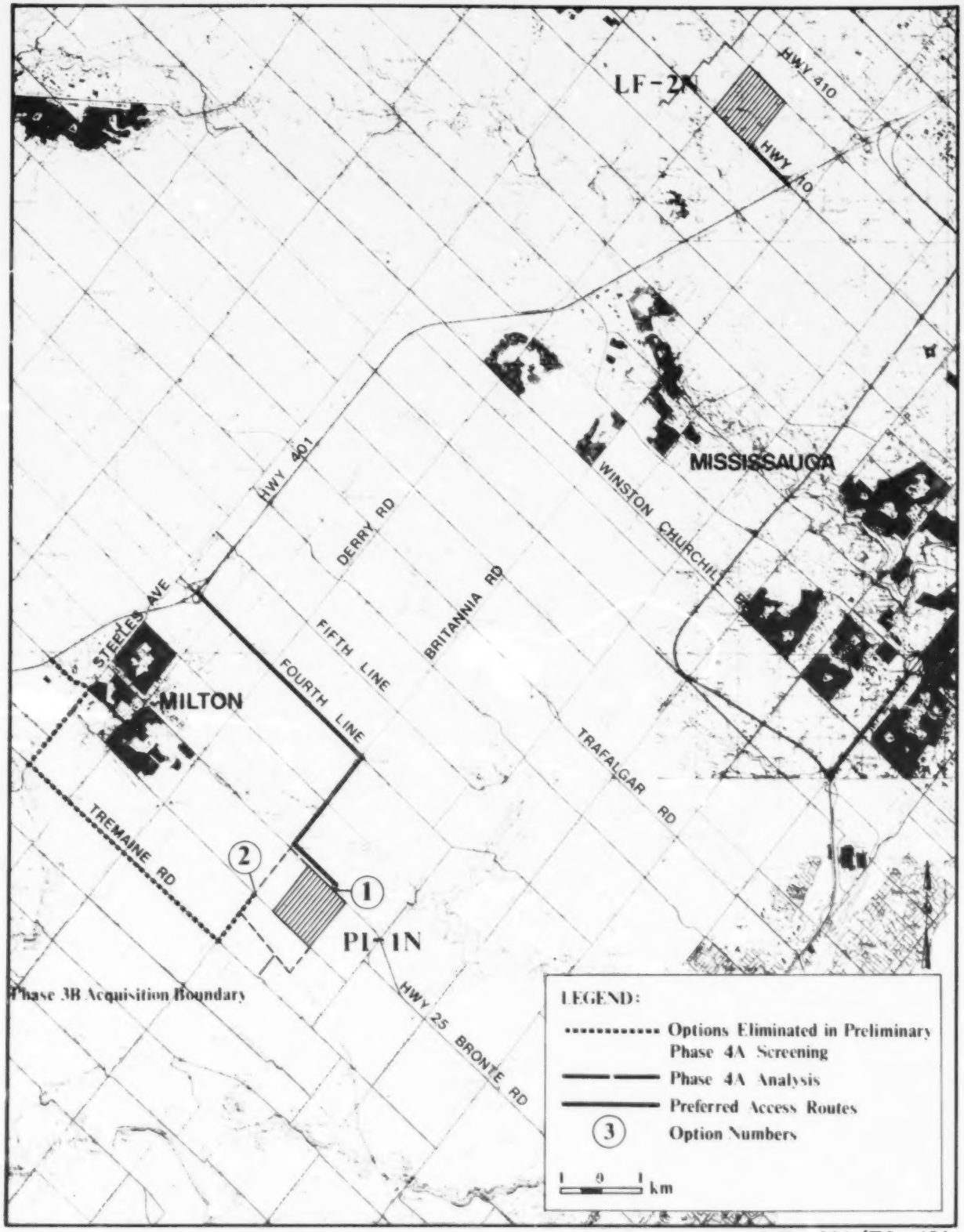
FIGURE C 8



LF-2N/PI-1N
TO PI-1N

PHASE 4A ACCESS ROADS

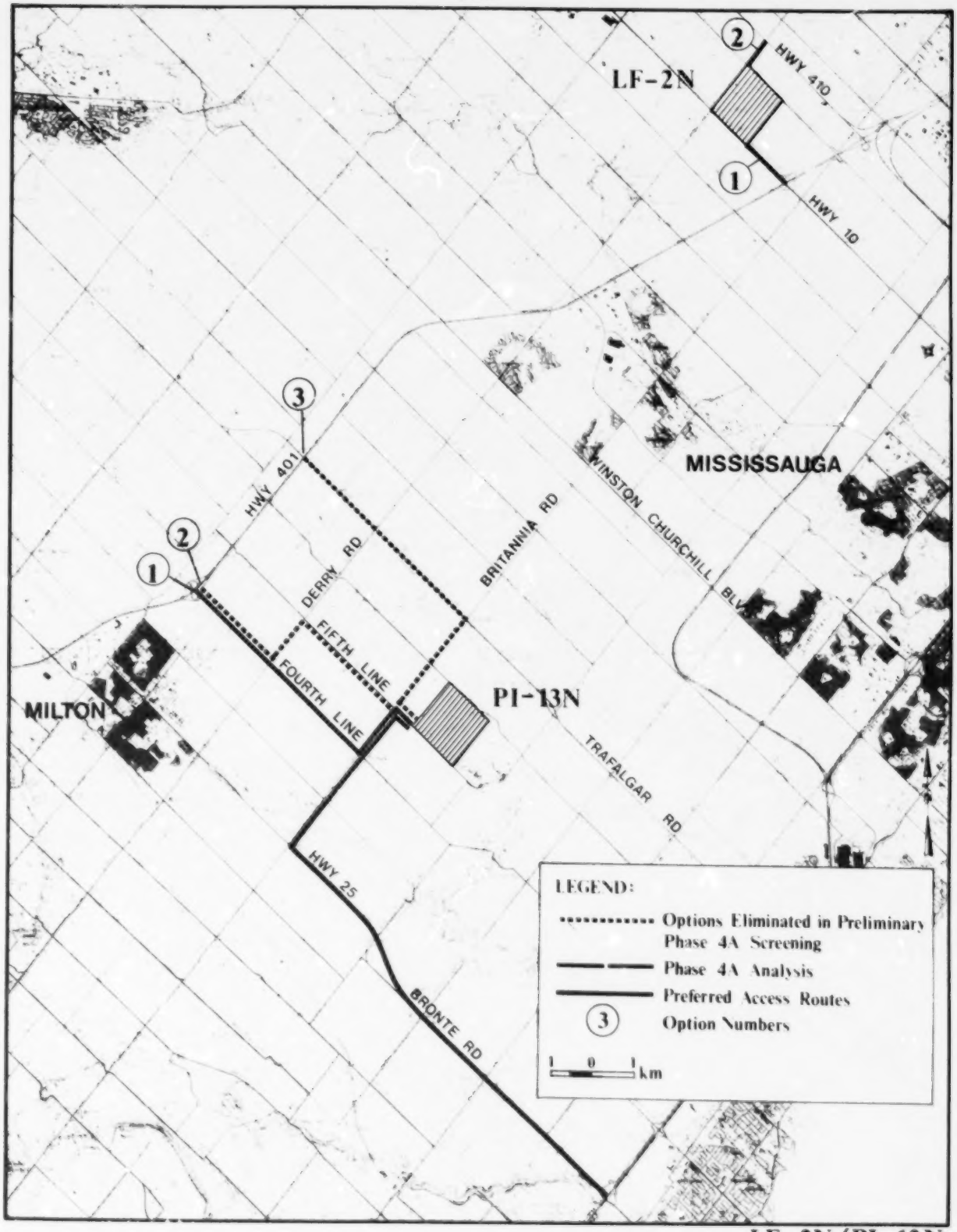
FIGURE C 9



LF-2N/PI-1N
PI-1N TO LF-2N

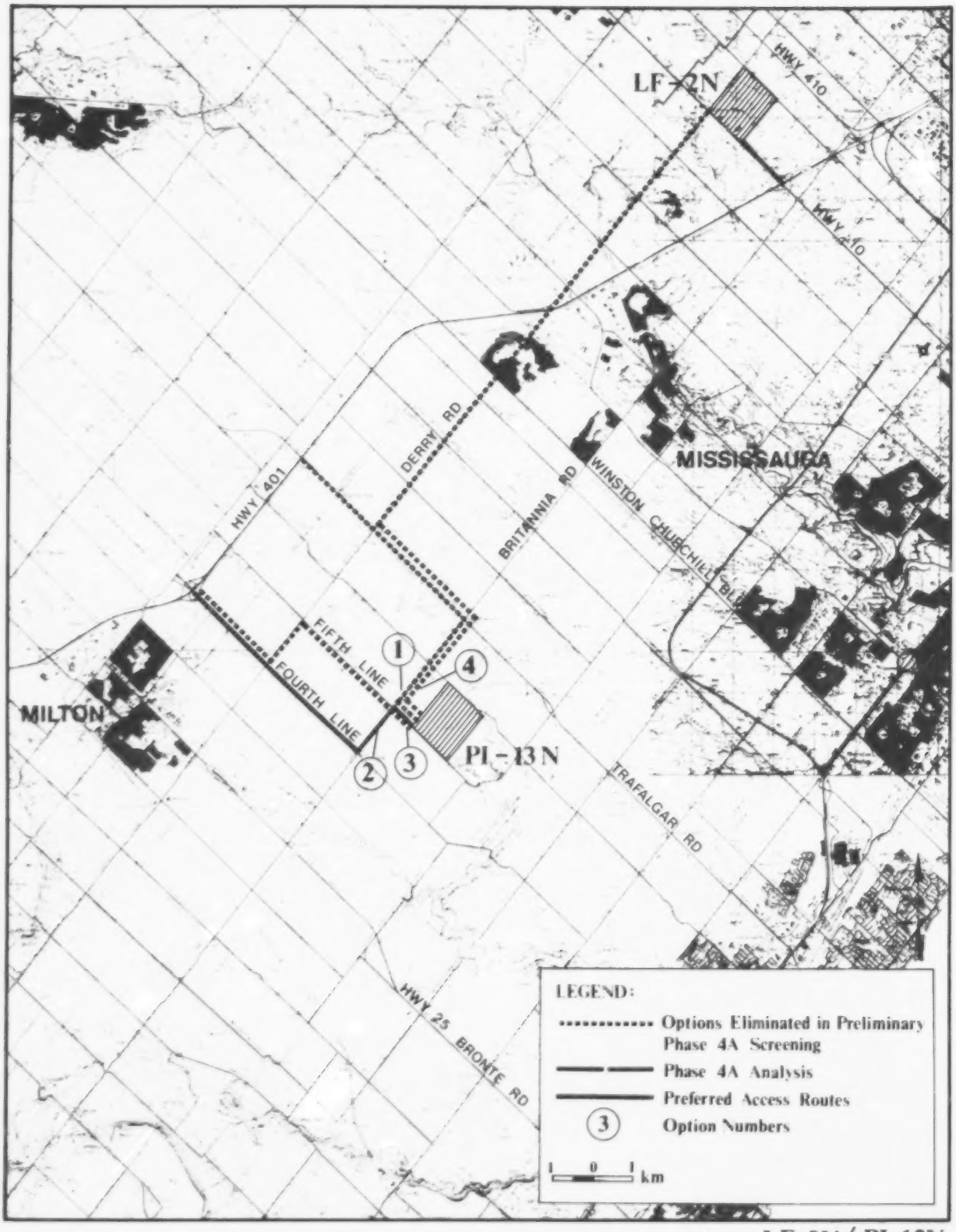
PHASE 4A ACCESS ROADS

FIGURE C 10



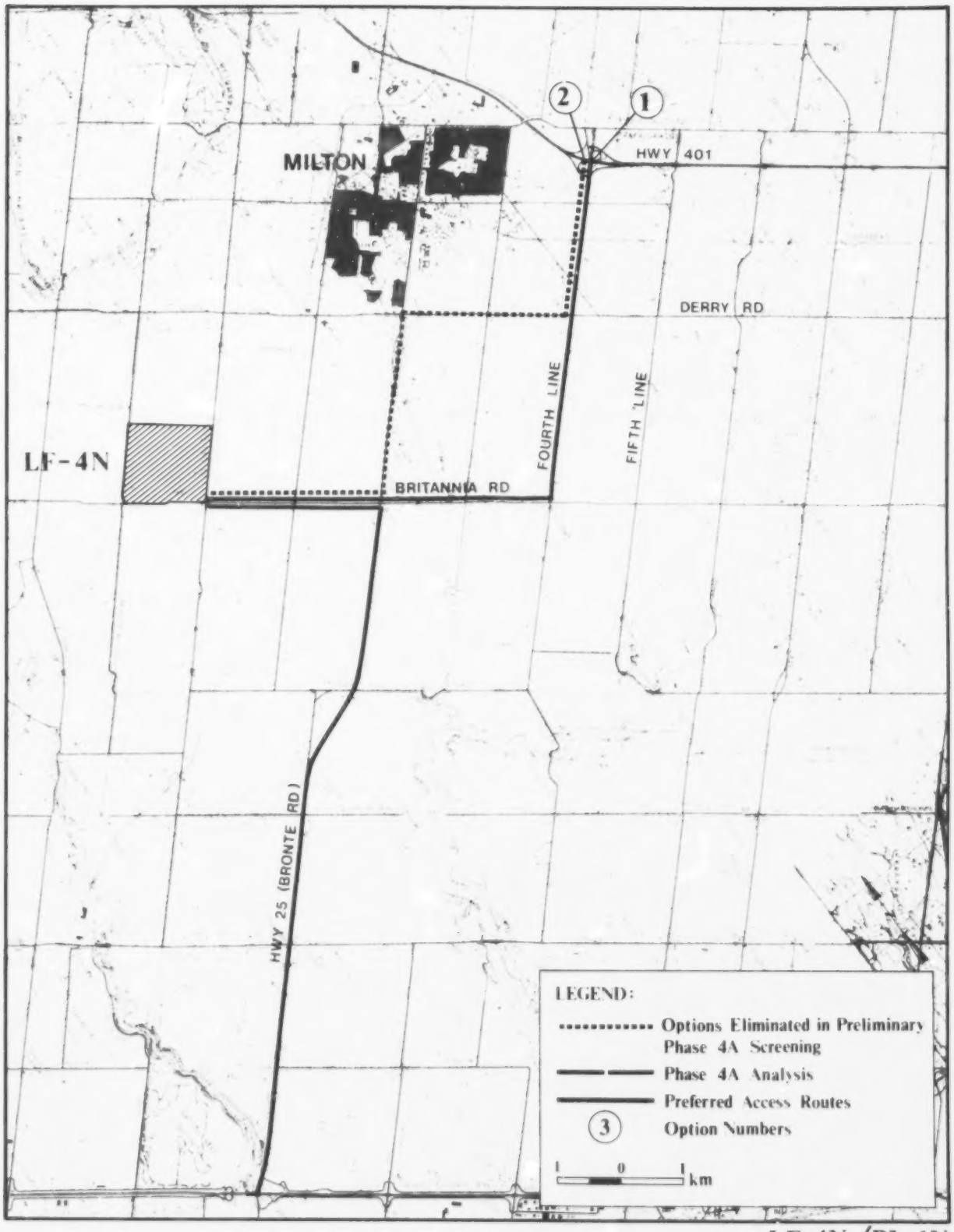
LF-2N/PI-13N
TO PI-13N
PHASE 4A ACCESS ROADS

FIGURE C11



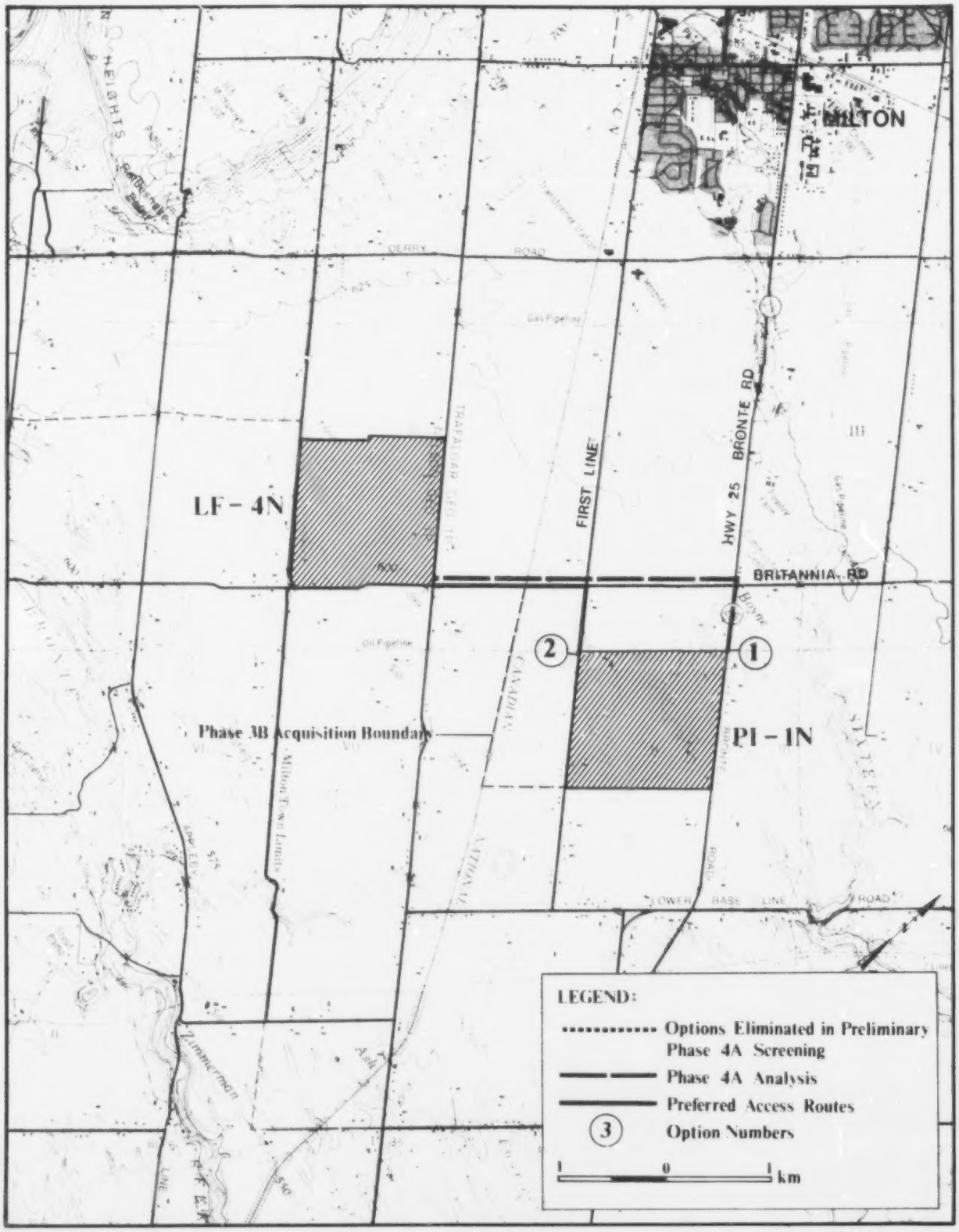
LF-2N/ PI-13N
PI-13N TO LF-2N
PHASE 4A ACCESS ROADS

FIGURE C12



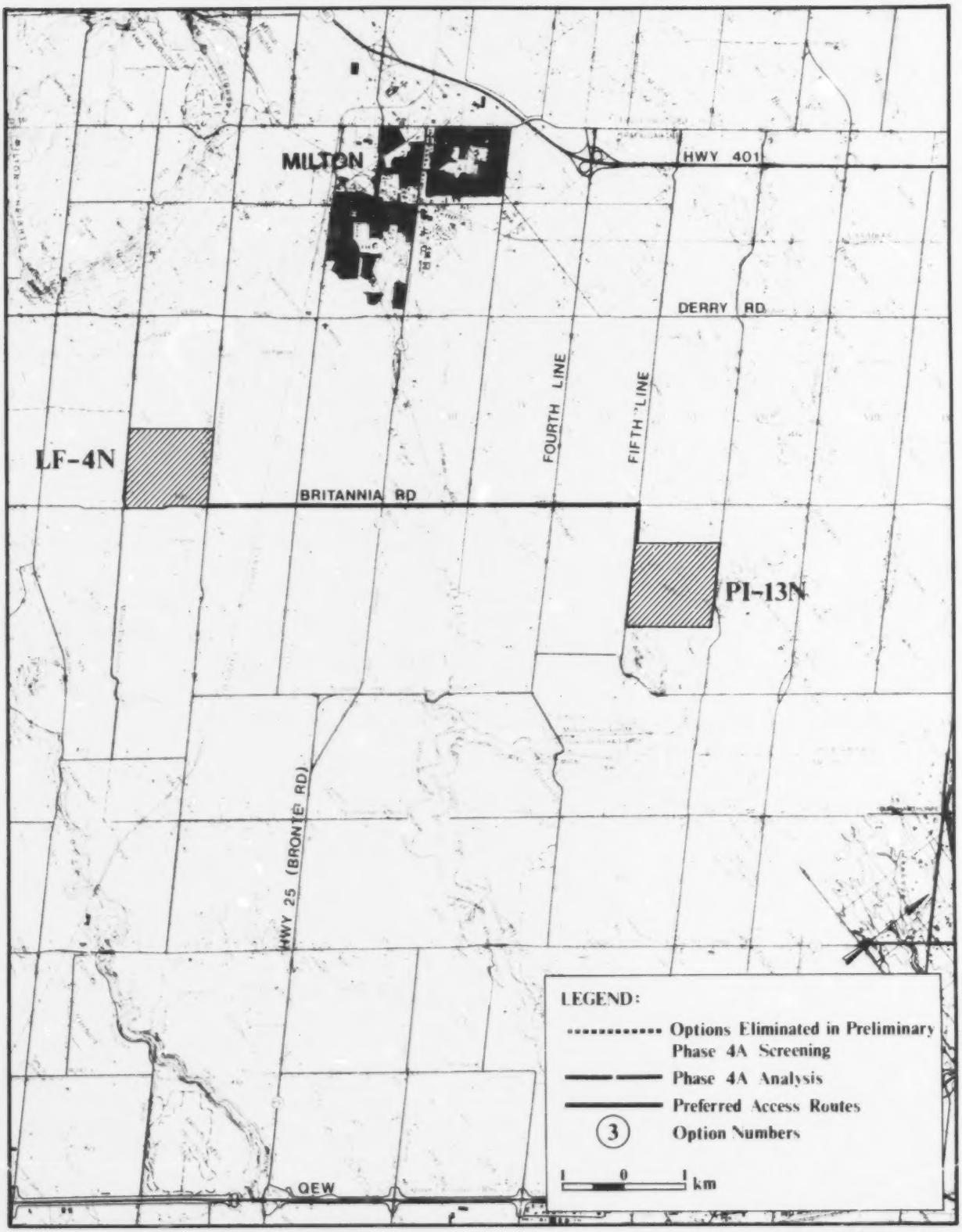
LF-4N /PI-1N
TO LF-4N
PHASE 4A ACCESS ROADS

FIGURE C13



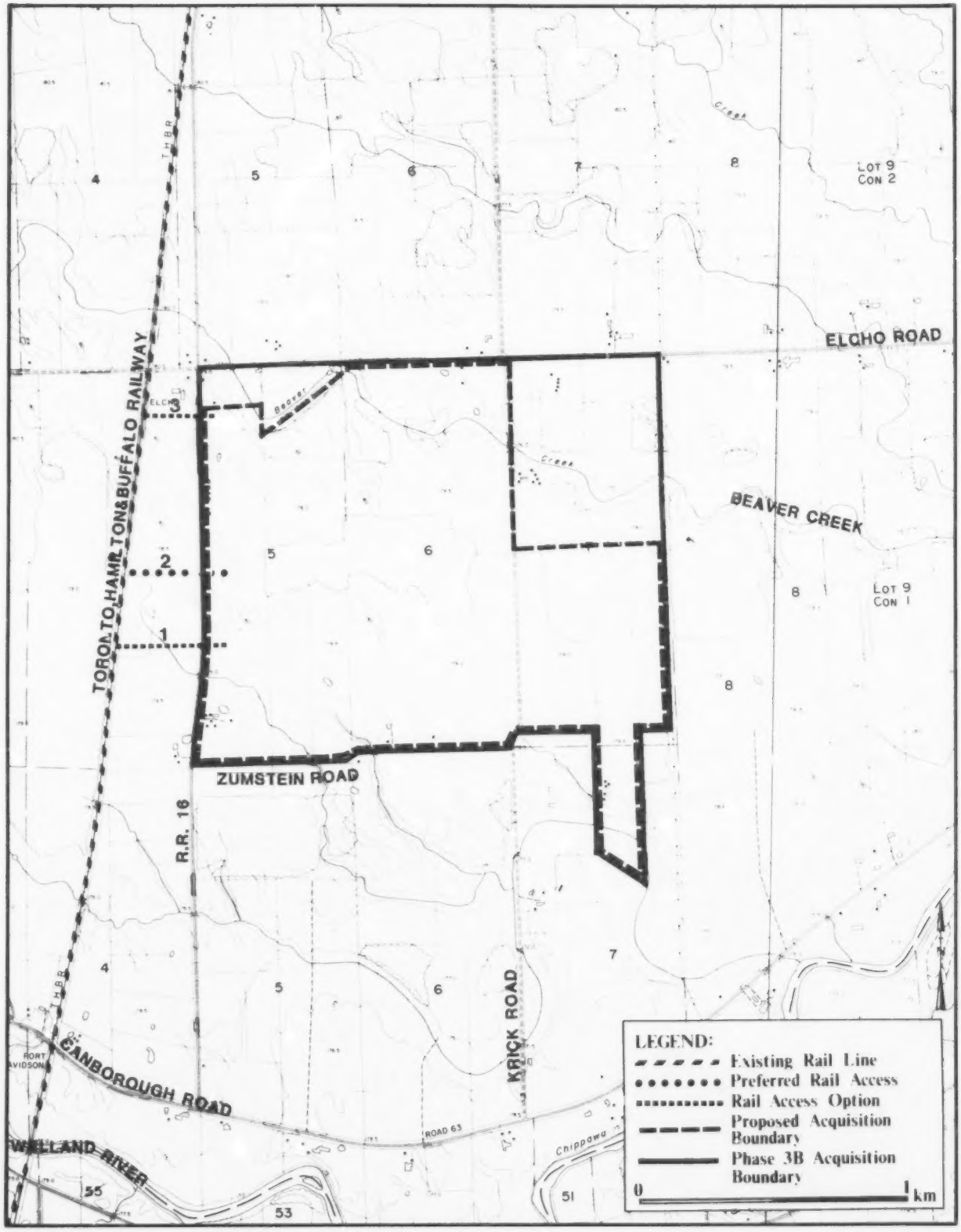
LF-4N/ PI-1N
PI-1N TO LF-4N
PHASE 4A ACCESS ROADS

FIGURE C14

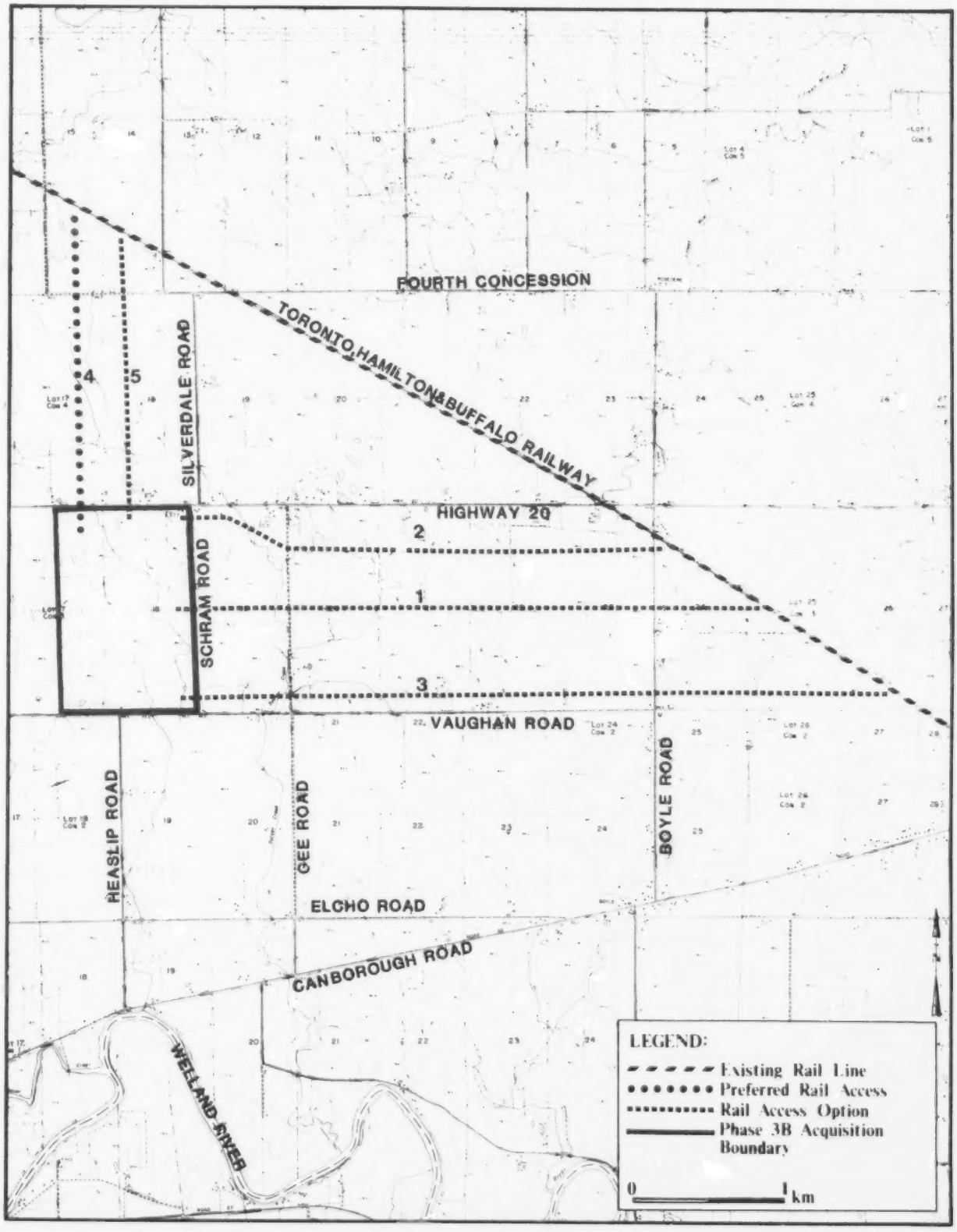


LF-4N/ PI-13N
PI-13N TO LF-4N
PHASE 4A ACCESS ROADS

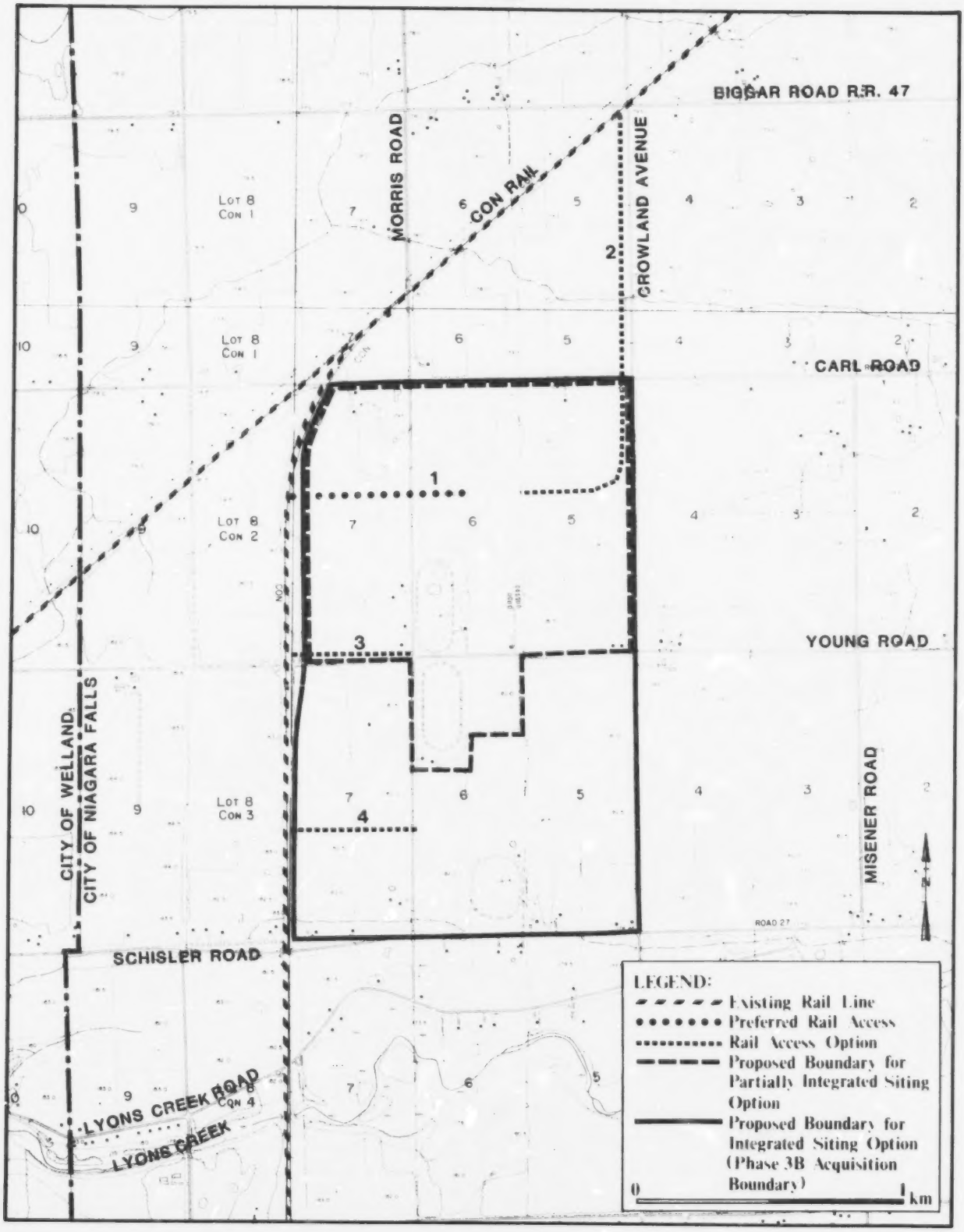
FIGURE C15



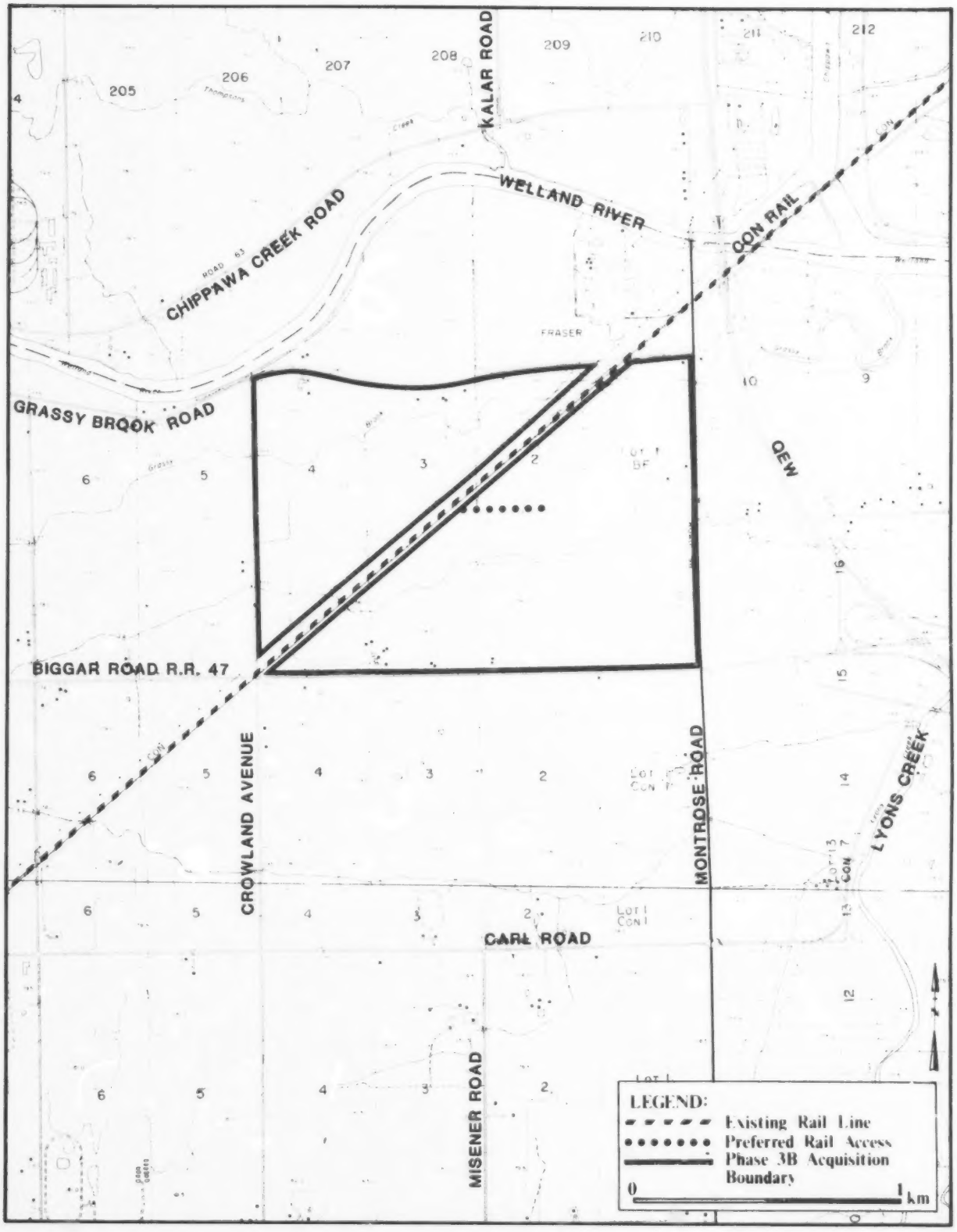
LF-3C
RAIL ACCESS
FIGURE C 16



LF-9C
RAIL ACCESS
FIGURE C17

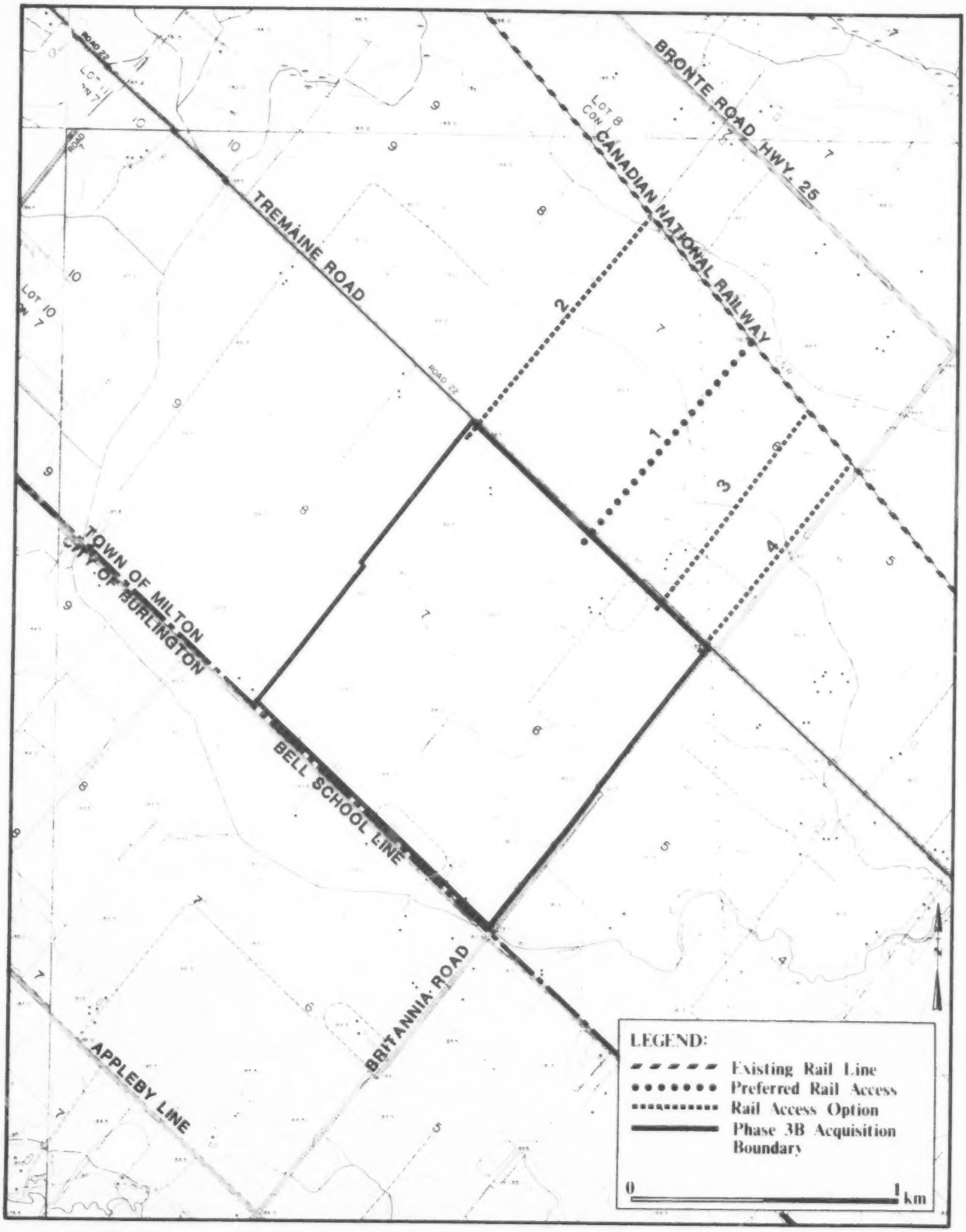


LF-1E
RAIL ACCESS
FIGURE C 18

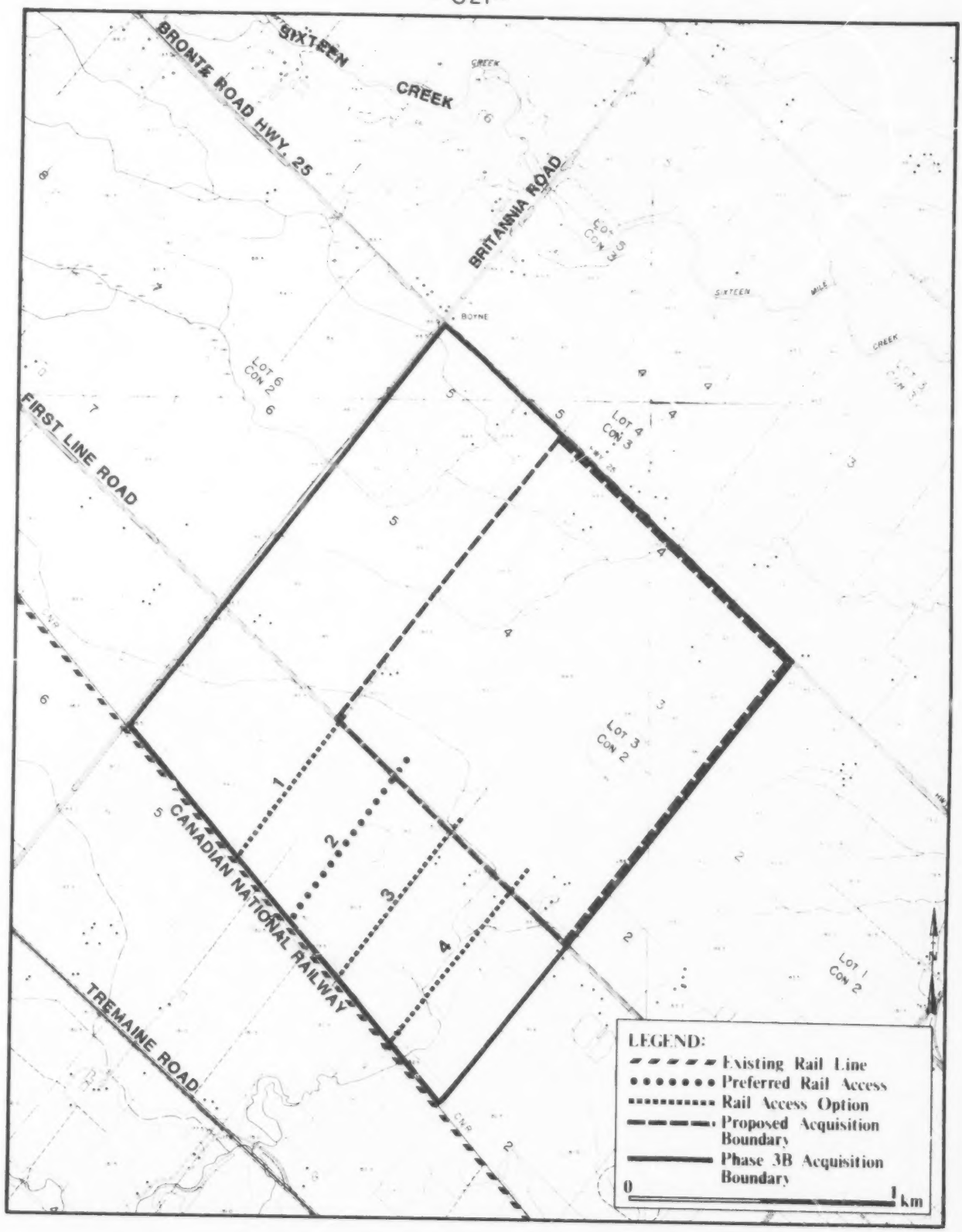


PI-27E
RAIL ACCESS

FIGURE C 19



LF-4N
RAIL ACCESS
FIGURE C20



PI-1N
RAIL ACCESS

FIGURE C 21